

AD-A103 566

BOLT BERANEK AND NEWMAN INC CAMBRIDGE MA
PLAIN SPEAKING: A THEORY AND GRAMMAR OF SPONTANEOUS DISCOURSE. (U)
JUN 81 R REICHMAN
BBN-4681

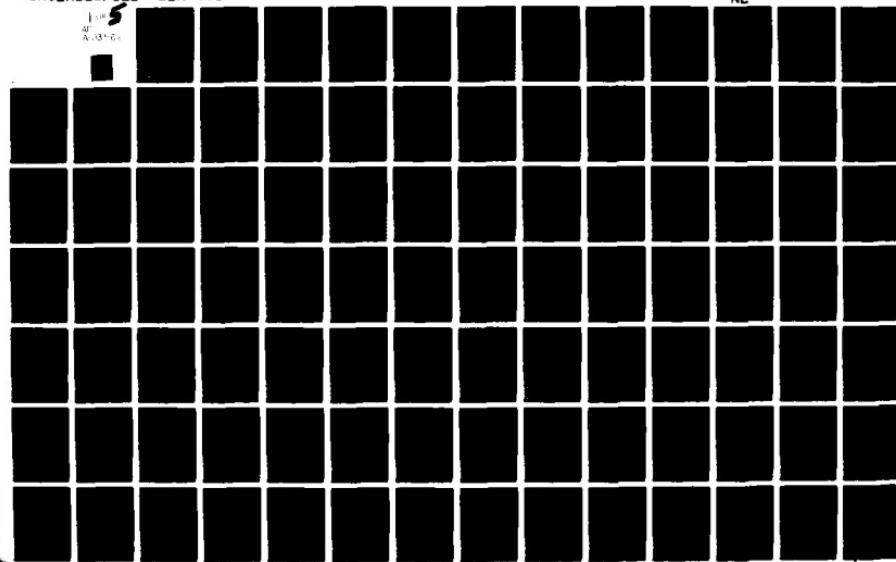
F/G 5/7

N00014-77-C-0371

NL

UNCLASSIFIED

JUN 5
81
R REICHMAN
BBN-4681



Bolt Beranek and Newman Inc.

BBN

BBN

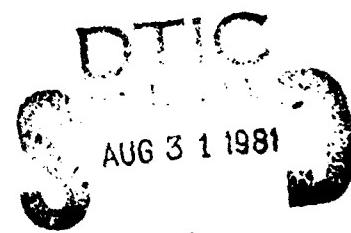
Report No. 4681

AD A103566

**Plain Speaking: A Theory and Grammar
of Spontaneous Discourse**

R. Reichman

June 1981



Submitted to:
The Office of Naval Research

TMIC FILE COPY

This document has been approved
for public release and sale; its
distribution is unlimited.

81 8 31 169

Unclassified.

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM	
1. REPORT NUMBER BBN Report No. 4681		2. GOVT ACCESSION NO. AD-A103566	
4. TITLE (and Subtitle) PLAIN SPEAKING: A THEORY AND GRAMMAR OF SPONTANEOUS DISCOURSE		5. TYPE OF REPORT & PERIOD COVERED Technical Report June 1981	
7. AUTHOR(s) Rachel Reichman		8. PERFORMING ORG. REPORT NUMBER BBN Report No. 4681	
9. PERFORMING ORGANIZATION NAME AND ADDRESS Bolt Beranek and Newman Inc. 10 Moulton Street Cambridge, MA 02238		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS CH201	
11. CONTROLLING OFFICE NAME AND ADDRESS Office of Naval Research 800 North Quincy St. Arlington, VA 22217		12. REPORT DATE June 1981	
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		13. NUMBER OF PAGES 410	
		15. SECURITY CLASS. (of this report) Unclassified.	
		16a. DECLASSIFICATION/DOWNGRADING SCHEDULE	
16. DISTRIBUTION STATEMENT (of this Report) Distribution of this document is unlimited. It may be released to the Clearinghouse, Department of Commerce, for sale to the general public.			
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)			
18. SUPPLEMENTARY NOTES			
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Context space, communicative goal, focused processing, relevant discourse context, pronominalization, topic suspension and resumption, frame of reference, maxim-abiding, state and focus level assignments, relevance.			
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report presents an abstract process model of "well formed" discourse. The model is based on a hierarchical segmentation of utterances into distinct, but related and linked, <u>context spaces</u> . Context spaces are characterized by slots similar to case frames. The slots are functionally defined and they capture information both explicit and implicit in the dialogue.			
In a context space theory of discourse, a conversation is viewed as a			

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 68 IS OBSOLETE

Unclassified.

cont'd.

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Unclassified.

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

20. Abstract (cont'd.)

sequence of conversational moves. A conversational move corresponds to a speaker's communicative goal. "Support," "Interrupt," and "Challenge," are some of the communicative goals identified in the work.

All conversational moves have an associated set of preconditions which specify the requisite discourse context for their appropriate performance. Conversational moves also have a set of effects on the discourse structure, and different modes of fulfillment. A major aspect of the work is to delineate the different preconditions, effects, and modes, characterizing different types of conversational moves in a discourse.

It is shown that effective communication between conversants is enabled by their following a number of well-specified rules in a discourse. These rules include choice of reference to an entity under discussion and use of clue words like "But anyway," and "Incidentally."

The discourse model is written in terms of an Augmented Transition Network where the tests and actions specified along transitions capture the context sensitivity between different portions of a discourse.

Fundamental characteristics of the designed model complement current theories in cognitive processing: segmentation, selective attention, frame of reference processing, expectations, and cues. In addition, the report highlights issues as the relevance of formal logic to discourse argumentation, the notion and psychological reality of a "language faculty," the distinction between a world knowledge and linguistic theory of discourse, and identification of those aspects of knowledge considered important in analogy.

Accession For	
NTIS GPO&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By _____	
Distribution/	
Availability Codes	
Avail and/or	
Dist	Special
A	

Unclassified.

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

BBN Report No. 4681

PLAIN SPEAKING: A THEORY AND GRAMMAR OF SPONTANEOUS DISCOURSE

Rachel Reichman

June 1981

This report is a thesis submitted to The Division of Applied Sciences, Harvard University, in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the subject of Applied Mathematics, May, 1981.

This research was supported in part by the Office of Naval Research, Department of the Navy, under Contract No. N00014-77-C-0371.

The views and conclusions contained in this document are those of the author and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the Office of Naval Research or the U.S. Government.

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	1
SYNOPSIS	III
1. INTRODUCTION	1
1.1 Main orientation of work	1
1.2 Major themes addressed	3
1.3 Kinds of dialogue studied	3
1.4 Type of analysis provided	5
1.5 Further details on themes	8
1.6 Overview of thesis organization	11
2. THE BASIC ELEMENTS OF A DISCOURSE	13
2.1 Discourse phenomena	13
2.1.1 Context spaces and conversational moves	14
2.2 Theoretical framework	20
2.2.1 Context spaces	20
2.2.2 Conversational moves	22
2.3 Abstract process model	24
2.3.1 ATN's - States and Arcs	24
2.3.2 ATN's - Registers	26
2.3.3 The Discourse ATN	26
2.3.4 Updating the relevant discourse context	28

2.4	2.3.5 Surface structure versus deep structure	30
	Cognitive modeling	31
	2.4.1 Independence issue	32
	2.4.2 The language faculty	34

3. SO HOW DO WE SEGMENT AND INTERPRET UTTERANCES? 37

3.1	Discourse phenomena	37
	3.1.1 Context space boundary points	37
	3.1.2 The constituents of a discourse	40
	3.1.3 Focused processing	43
	3.1.4 Discourse expectations	46
3.2	Theoretical framework	47
	3.2.1 Subordination of spaces	47
	3.2.2 Focused processing	48
3.3	The Discourse Grammar	49
	3.3.1 Updating State assignments	49
	3.3.2 Updating of registers	51
3.4	Cognitive Modeling	54

4. FURTHER DETAILS ON CONVERSATIONAL MOVES 57

4.1	Discourse phenomena	57
	4.1.1 Because/Like/Like when: Support	59
	4.1.2 So: Restatement of point being supported	61
	4.1.3 Incidentally/By the way: Interruption	61
	4.1.4 Anyway/In any case: Return	62
	4.1.5 Yes/Right but: Indirect Challenge	63
	4.1.6 (No) But: Direct Challenge	64
	4.1.7 All right/Okay but: Subargument Concession	64
	4.1.8 Support-Challenges	65
	4.1.9 But look/listen/you see: Prior Logical Abstraction	68
	4.1.10 But ... (though): Contrastive Respecification	70
	4.1.11 It's like/the same as: Analogy	71
	4.1.12 Now: Further Development	74
	4.1.13 Further notes on Analogy	76
	4.1.14 Succession of conversational moves	79
4.2	Formal framework	84
	4.2.1 State assignments	85

4.2.2	Types of context spaces	87
4.3	The Grammar - Updating the discourse model	97
4.3.1	The Support & Further Support moves	98
4.3.2	The Restatement move	99
4.3.3	The Interruption move	100
4.3.4	The Return move	100
4.3.5	The Indirect Challenge move	100
4.3.6	The Direct Challenge move	101
4.3.7	The Subargument-Concession move	101
4.3.8	The Logical Abstraction Move	102
4.3.9	The Contrastive Respecification move	102
4.3.10	The Analogy move	102
4.3.11	The Further-Development move	103
4.4	Cognitive modeling	103
4.4.1	Analogies in spontaneous discourse	103
4.4.2	Formal logic and spontaneous discourse	106
5. SURFACE LINGUISTIC PHENOMENA		109
5.1	Referring expressions	109
5.1.1	Traditional theories of reference	110
5.2	Context space theory of reference	115
5.2.1	State value of the referent's context space	116
5.2.2	Focus level assignments	119
5.3	Conclusion	140
6. THE GRAMMAR: BASIC SCHEMATIZATION		141
6.1	Control structures	141
6.1.1	ATN representation	141
6.1.2	Program representation	142
6.2	Data structures	143
6.2.1	The Registers	144
6.3	Flow description - Design criteria	146
6.3.1	Organizational, constructive, and productive routines	146
6.3.2	Discourse expectations	148
6.3.3	When to choose next speaker	150
6.4	Illustrative example	152
6.4.1	The Excerpt	152

6.4.2 The Discourse Model	152
6.4.3 The Trace	157
6.5 Violations of pretests	168
6.6 Conclusions	174
7. THE GRAMMAR: CONTEXT SPACE SUSPENSIONS & RESUMPTIONS	195
7.1 Expected vs unexpected resumptions	195
7.2 Resumption after a subargument	196
7.2.1 Conceding a subargument	198
7.2.2 Joining forces	206
7.3 Example: Trace of pop in Excerpt 16	207
7.4 Example: Trace of challenge in Excerpt 16	213
7.5 Conclusions	216
8. MAJOR PRINCIPLES/CLAIMS OF THE CONTEXT SPACE THEORY	231
8.1 Selective attention and a frame of reference	231
8.1.1 Focused processing and selective attention	232
8.1.2 Discourse processing and frame-of-reference identification	233
8.1.3 Selective attention and reference frame identification	236
8.2 Fixing up context space boundary points	237
8.2.1 Misleading story development	238
8.3 Cognitive structuring of information	239
8.3.1 The Abstract-Context-Space-Schemata	240
8.3.2 Genre specialization	243
8.3.3 What does structure mean?	244
8.3.4 Structure and schemata	245
8.3.5 Different genres different structures?	247
9. A LINGUISTIC VS WORLD KNOWLEDGE THEORY	251
9.1 Communicative goals versus speaker intent	252
9.1.1 On the issue of text linguistics	256

9.1.2 A fixed meaning in text?	263
10. COMPARISON WITH OTHER WORKS	269
10.1 Communicative goals and speaker intent	269
10.1.1 World knowledge - speaker intent approaches	269
10.1.2 The contrastive view	271
10.1.3 An integrated approach	272
10.2 Discourse-Genre specialization	274
10.3 The Ethnomethodologists	278
10.4 The Tagmemic school	283
10.5 The Functional-Sentence-Perspective approach	285
10.6 Some structural approaches	290
10.7 Some other theories	295
10.8 Conclusions	302
11. CONCLUSION	303
11.1 The Discourse-ATN	306
11.1.1 Credence of design	306
11.1.2 Generation rules and the relevant discourse context	307
11.1.3 Pushes and Pops	309
11.1.4 Why call the grammar an ATN	311
11.1.5 Next phase of grammar design	312
11.2 Structure characterization yet to be done	313
APPENDIX APPENDIX I:.. THE CONTEXT SPACE ATN GRAMMAR	315
APPENDIX APPENDIX II:.. THE NATURE-NURTURE DIALOGUE & A TRACE	359
II.1 The Nature-Nurture Controversy	359
II.2 Tracing through portions of the dialogue	362

ACKNOWLEDGEMENTS

Over the course of my graduate school career I have been to many places, and have met many wonderful, considerate, and intelligent people. These individuals all aided me in the long enduring process of obtaining a doctoral degree. To these people (not all of whom are listed here) I say thank you.

To Bill Woods, who as my mentor has played a most important role in my life over the last two years. Throughout this period Bill has been a source of intellectual exchange, and he has always been ready to react to my ideas. His understanding of what it was I was trying to do, helpful guidance in training me with those tools needed to achieve it, and his own analytic insights into the work have all proved invaluable in my education. I am deeply indebted to Bill for his patience and for the time he spent with me on the thesis.

To Allan Collins, who from the day we met has always been interested, encouraging, and tremendously insightful about my work. I have rarely had to explain to Allen what it was I was doing, he always understood. Allan has spent many hours over the past four years discussing with me elements of the theory, and he has patiently tutored me in the skills needed to explain it to others.

To Tom Cheatham, who financially supported my research for many years, and who chaired my thesis committee. And to Steven Pinker and Susumu Kuno, for reading my thesis and being members of the committee.

To Paulene Mitchell, who from my first visit to Harvard has proved to be a most warm, kind, and helpful resource.

To members of ISSCO, Geneva, for providing me with such a pleasant and supportive place in which to do my work in 1979, and for their patience in listening to "steam plant" dialogues over the span of many months. I want to particularly thank Maggie King, director of the Institute, for among other things, having a daughter named Rachel.

To Yorick Wilks and James Allen, both of whom made timely visits to Boston, and who provided insightful comments at the crucial initial writing stages of this thesis.

To Brad Goodman, for having to share an office with someone in the critical stages of thesis writing. Brad has always proved a supportive and helpful friend, his assistance ranging from catering dinners and proofreading to looking up esoteric commands in Scribe.

To Betty Bahne, a friend who shared her home and provided me a supportive place to do my work over many months last year, and whose fine herb spice added a special touch to our many dinners together. Without Betty's wonderful companionship over the stretch of months where my main phrase was "I just don't know what Bill wants" it is probably doubtful that I would have had the wherewithall to continue this work.

To BBN for its welcoming environment, and the many people at BBN, in various functions, who have always helped and encouraged me in my work.

To Ira Goldstein, John Allen, and Susumu Kuno, my first teachers in natural language processing, and Roger Schank for a summer spent at Yale.

To my family, who came through when the going got rough.

Finally, to some other personal friends and colleagues, Marty Yonke, Dawn Parnell, Mike Beeler, Marion Cohen, Senetta Avram, Lisa Karp, Fran Guterman, Eli Tal-El, Robbin Feibus, Tara Zend, and Chaim Kline, who were a constant source of encouragement, friendship, intellectual stimulation, and just plain fun.

SYNOPSIS

This thesis deals with the analysis of naturally occurring dialogues - especially the supposedly unstructured dialogues that occur spontaneously in casual conversation. The major thesis of the work is that informal dialogues are highly rule governed and amenable to a formal analysis.

In the thesis, I present a rule-based theory of discourse, called the Context Space theory, and I present an abstract process model, based on this theory, which is capable of generating/interpreting "well formed" discourse.

Current computer natural language front-end systems mainly treat utterances in isolation and function merely as "information retrievers." Useful front-end systems, however, will need to take more conversational initiative and they will have to employ rules to determine the relation of an utterance to the preceding discourse context. In particular, it is clear that users come to the communicative process with a whole set of rules and expectations about "well formed" functional relations between different sections of a discourse.

The following excerpt, taken from a simulated interchange between a user and computer system at the Coordinated Science Laboratory at the University of Illinois, exemplifies the type of discourse phenomena that computer front-end systems will have to deal with. The system's data base is on aircraft malfunctions, and users are asked to use the system to determine malfunction patterns [44, 132].

Excerpt

U: How many hours did work centers spend on down-time in 1971?

S:	Year	Work Center	Down-Time
1971		PE3	21,829
1971		AF3	3,757

1971	AC2	22,733
1971	PE1	1,847

U: Can you determine if there was a high concentration of one type of malfunction for the two work centers PE3 and AC2?

But, first, I would like to see that above work center information for 1972.

S:	<u>Year</u>	<u>Work Center</u>	<u>Down-Time</u>
	1972	PE3	15,327
	1972	AF3	912
	1972	AC2	1,176
	1972	PE1	15,926

Do you want to see the data on PE3 and AC2?

U: Yes, for 1971 and 1972.

Points of interest in the above excerpt:

1: U's "But, first" utterance serves to put his first order on hold, and results in the expectation that after the second request is fulfilled, the computer will perform the first request.

2: A computer system performing as S does must take the initiative in discourse engagement, and be able to recognize and carry out any outstanding discourse expectations placed on it.

3: Notice that in S's return to U's suspended order, S uses the unmodified noun phrase, "the data," to refer to 'data on a high concentration of one type of malfunction ...' despite the fact that interveningly a new set of data had been introduced into the conversation. The context space process model would similarly use such an unmodified noun phrase here. This is because its discourse rules of reference are not based on criteria of linearity and resulting issues of semantic ambiguity. Rather, they are based on the observation that it is a relevant discourse context which governs discourse referencing choices. Since returning to an interrupted subject of discourse removes all intervening digressive utterances from a relevant

discourse context, "the data," in S's resumption of the user's initial request, uniquely refers to the data in the discourse context preceding the "But first" digression.

4: The user must specifically amend his initial order to get data on 1972 included in the suspended request, despite the fact that immediately preceding his "yes" response 1972 was the subject of discussion. This again is explained by the fact that resumption of an interrupted subject removes all intervening discourse from the discourse context considered in subsequent discussion.

As highlighted in the above, a major feature of extended discourse is topic suspension and resumption. In addition, as illustrated, at any given point of discussion, only a small portion of preceding discourse is selectively focused on and considered in the subsequent engagement.

The discourse theory proposed in this thesis is one based on a hierarchical structuring of discourse utterances into distinct, but related and linked, context spaces. Context spaces are functionally characterized and they encode information both explicit and implicit in the discourse. By associating different levels of influential status with a context space, the context space system is able to model people's selective attention on highlighted portions of a discourse. Tracking these highlighted portions of the conversation is a major task of the abstract process model presented in this thesis.

In the context space theory, a conversation is seen as a sequence of conversational moves, wherein each move corresponds to a speaker's communicative goal vis-a-vis a particular preceding section of discourse. A conversational move, usually, results in a context space shift in the conversation, the reassignment of the influential status of preceding context spaces, and the creation of discourse expectations of moves most likely to follow. Recognizing and modeling these types of standardized effects accompanying different conversational moves enables the system to track the changing relevant discourse context as a conversation proceeds. Support,

Explain, Challenge, and Further-Develop, are prototypical of the types of conversational moves defined in this work.

A conversational move has a set of preconditions which specifies the requisite discourse environment for its appropriate performance. For example, you can not resume from a point of interruption if there has been no digression. Conversational moves also have different modes of fulfillment. For example, one can support a preceding claim by giving an instance of its occurrence, or merely by citing some authority-support for it.

The grammar uses an Augmented Transition Network (ATN) [142] and predicate calculus-like formalism in order to characterize the different preconditions, effects, and modes for fulfilling different conversational moves. ATN networks are traversed via arc transitions. Along all transitions are a number of tests which must be satisfied for the transition to be appropriate, and a set of actions, execution of which corresponds to performing the arc transition. In the discourse ATN, these tests and actions correspond to the preconditions and effects of conversational moves, and state transitions, often, correspond to a finer characterization of conversational move mode fulfillment.

As the grammar goes through its cycles of arc transitions, it continually updates its model of the conversation. For example, whenever, the process model processes an "Interruption" conversational move it creates the discourse expectation of resumming the subject interrupted. Modeling S's return initiation in the excerpt above, for example, entails executing such a return expectation. The process model's updating actions enables it to model natural extended communication, wherein there is a high degree of context sensitivity between preceding and succeeding discourse constituents.

The context space theory delineates a single abstract structure underlying all discourse forms - expository text, argumentative text, narrative text - and based on such structure characterization it is able to specify a single set of "maxim-abiding," "well-formedness" rules applicable to, and governing all discourse forms. These rules include, among others: (1) generating clue words to signal the type of conversational move about to be

performed; (2) characterizing discourse reference rules based on a current "foci" of conversation, enabling effective modeling of many seeming surprising cases of pronominalization and nonpronominalization in natural discourse; (3) formalizing a set of data structures needed to track those aspects of the preceding discourse relevant to continued conversational development; and (4) updating these structures in a systematic way based on a formal characterization of the effects of conversational moves.

The theory's fundamental elements of analysis complement current research in cognitive processing:

Cues; Expectations; Segmentation; Selective Attention;
Hierarchical Structure; Frame-of-Reference Processing.

In the thesis I delineate a number of contributions of the context space theory to some prevailing hypotheses on different aspects of human cognitive processing procedures.

Both the surface linguistic phenomena found in an analysis of naturally ongoing discourse for which the theory provides an effective model, and the overlap between the grammar's mechanisms and those posited by cognitive psychologists, lend strong credence to the theory encoded in the context space discourse grammar. These correspondences also strongly highlight the necessity of having such a module in any computerized natural language system hoping to effectively engage in extended discourse.

1. INTRODUCTION

A conversation is often thought of as a linear sequence of utterances that can be generated by a rule-free process of communication. A close analysis of spontaneous discourse, however, forces one to reject such a conjecture, and to recognize that conversational speech is highly rule-governed, and that at a deeper level of analysis, a conversation is a hierarchical organization of formally related utterances [84, 49, 112].

I will argue that the hierarchical view facilitates formulation of a coherent and integrated theory of discourse that simultaneously: 1. accounts for and explains many surface linguistic phenomena found in conversational speech; 2. identifies the relevant discourse context in which a new utterance is interpreted/generated; 3. explains the semantic coherent flow of a conversation; and 4. specifies options available to conversants at discrete points in the discourse.

1.1 Main orientation of work

Grice states that the conversational process is composed of a set of "stages" with the execution of each "conversational move" taking us to another stage of the discourse [46]. Describing this process, Grice notes that at any given point, it seems fair to say that "some possible conversational moves would be excluded as conversationally unsuitable" (Pg. 45). Grice proposes a set of conversational maxims, and defines "inappropriate" conversational moves as the set of moves that would violate at least one maxim. Such maxims include:

- o Quantity: "Make your contribution as informative as required (for the current purposes of the exchange) and do not make your contribution more informative than is required."
- o Relation: "Be relevant;" take into account the "different kinds and

foci of relevance," "how these shift in the course of a talk-exchange," and "allow for the fact that subjects of conversation are legitimately changed."

- o Manner: "How what is said should be said," e.g., "avoid obscurity of expression, avoid ambiguity, be brief, and be orderly."

These maxims capture some of the dynamic constraints placed on conversants in dialogue. They also raise the following questions: 1. What is a discourse context? 2. What does it mean for something to be in the "foci" of this discourse context, i.e., what influences does the subject of the discourse foci have on the discourse's succeeding semantic development and on the surface linguistic tools used to express developments? 3. How does a conversational move affect the preceding discourse context? 4. How does the discourse context determine what otherwise would be an ambiguous reference or an overly informative utterance? 5. What is "relevance," i.e., can relevance be formally defined as a set of semantic/logical relationships between utterances? and 6. Given a more exact specification of such maxims, how can they be integrated to yield a system capable of discourse modeling as an active process? This work endeavors to answer such questions.

The main force of the work identifies and formalizes the nature of a conversation in terms of specific constructs and manipulations of such, so that an abstract process model of discourse generation and/or interpretation can be formulated. The model to be presented is based on the recognition that an utterance's "appropriateness," both in form and content, is highly dependent upon the current "relevant" discourse context. One can consider this work to be a formalization of constructs and operations that are needed to transform Grice's general maxims into a well-defined set of operational rules. The rules are stated in terms of identifiable discourse structures, formalized semantic/logical relationships between these structures, and consequential effects on these structures by the instantiation of a given semantic/logical relation at a particular point in time. The rules form a system capable of characterizing "coherent" or "maxim-abiding" conversational speech.

1.2 Major themes addressed

The work addresses the following four themes of investigation:

1. Structural analysis of discourse
2. Theoretical framework for the analysis
3. Formalized abstract process model for "well-formed" discourse generation/interpretation
4. Relation of formulated theory of discourse processing to other cognitive processing tasks

Each of the above themes can be further divided into constituent subtopics. These subtopics are numerous and varied, although they interrelate in distinct, interesting ways. In initial sections of the thesis, I present each subtopic individually; in later sections, I describe their integration.

The culminating aspect of the work is the formulation of a formal discourse grammar that can serve as an abstract process model for maxim-abiding conversational speech. The purpose of such a formalized model is manifold: (1) it elucidates the structural nature of cognitive processing tasks in general; (2) it delineates those points of overlap between cognitive processes responsible for different tasks; (3) it forces a detailed and integrated explication which facilitates the detection of missing or incorrect aspects of the work; and (4) it can serve as a foundation upon which computer systems, written in terms of such a formal model, can be built and used as a means of on-line person-computer conversational dialogue. Let us then begin with an example of a piece of dialogue that the system can model.

1.3 Kinds of dialogue studied

This thesis deals with the analysis of naturally occurring dialogues - especially the supposedly unstructured dialogues that occur spontaneously in

casual conversation. A major point of this thesis is that even these informal conversations have a rich, rule-governed behavior which is amenable to formal (or at least semi-formal) analysis.

The excerpt below exemplifies the type of discourses analyzed in this work. The excerpt is taken from an actual conversation between friends, M, R, D, and J. At this point in the conversation, the participants are debating the "genetic-environmental" controversy.

Excerpt 1

R: 1. Except however, John and I just saw this two hour TV
2. show

M: 3. Uh hum,

R: 4. where they showed - it was an excellent French TV
5. documentary - and they showed that, in fact, the
6. aggressive nature of the child is not really that
7. much influenced by his environment.

M: 8. How did they show that?

R: 9. They showed that by filming kids in kindergarten,

M: 10. Uh hum,

R: 11. showing his behavior among other children,

M: 12. And then?

R: 13. and showed him ten years later acting the same way,
14. towards, um,

D: 15. Well, of course, that's where he learns his behavior,
16. in kindergarten.

M: 17. Oh, sure.

R: 18. Now, another thing, it wasn't that he didn't have

J: 19. What? What's that? What'd you say?

R: 20. The aggressive child in kindergarten who acted the same

21. way later on.

J: 22. Yeah, he did.

R: 23. Oh, and it was twins. The important thing was that
24. there were two children from the same environment,
25. whereas only one of the brothers acted that way.
26. So, you couldn't blame it on the child's home.

D: 27. It has nothing to do with the child's home.
28. It has to do with the child's environment.

R: 29. Right, but the two brothers have the same environment.

D: 30. They do not have the same environment.

R: 31. Why not?

D: 32. Because you and I are very close in this room right now
33. but we don't have the same environment.
34. Because I'm looking at you, I'm seeing that window
35. behind you. You're not seeing that window behind you.
36. You are not looking at you I am doing it.
37. Two people can't be in exactly the same place at the
38. same time, otherwise, they'd occupy the same space.
39. They do not have the same environment.
40. They do not have the same friends.

M: 41. And, I mean, they don't even - You know, to say that
42. two kids come from the same family is really meaningless,
43. because when you think of the difference in treatment
44. that two kids can get in exactly the same family, it's
45. incredible. You know, it's the difference between night
46. and day.

1.4 Type of analysis provided

The abstract process model recognizes and characterizes the following features of the above passage.

A: A debate is going on with D and M on one side of the argument and R on the other side.

B: Lines 1 - 4 serve as an authority support for R's claim in Lines 6 - 7 for the "genetic" side of the argument.

C: Line 8 serves as a demand on R to provide support or evidence for this claim. The statement results in the expectation that R, on her next turn, will provide such evidence.

D: Although prefaced with "Well, of course," (seemingly a phrase of agreement), Line 15 serves as a challenge to R's preceding statements. It attacks R's support of her claim, thereby attacking the claim itself.

E: Lines 23 - 25 serve R as an alternate method of supporting the claim she made in Lines 6 - 7. By giving alternative support, R has implicitly accepted D's previous challenge; all of R's succeeding supports and claims cannot violate the implicit agreement that proof on the genetic side of the argument cannot be provided by accessing a child's environment after kindergarten.

F: Line 26 is a new claim by R. It is supported by Lines 23 - 25 and is used by R to modify and supersede her initial claim of Lines 6 - 7. In the context of the current argument (i.e., after acceptance of D's Line 15 challenge) only a child's environment before kindergarten is relevant. R therefore equates "environment before kindergarten" with "child's home" and addresses herself to this residual issue.

G: The antecedent of "it" on Line 26 is "the aggressive nature of the child" which was last mentioned on Line 6. Only constituents of utterances contained in the current relevant discourse context are viable antecedents for a pronominal form. A relevant discourse context for a replacement claim (such as the one on Line 26) is the claim being superseded (i.e., Lines 6 - 7). Using such a structural analysis of the discourse enables the grammar to model R's long distance pronominalization.

H: This same criteria of discourse pronominalization and structural analysis of a discourse, enables the grammar to model R's subsequent short distance nonpronominalization of "the two brothers" on Line 29 though they were just referenced on Line 24 and no other potential antecedents had intervened. By Line 29, Line 24 is no longer part of the relevant discourse context.

- o Concluding a set of supportive utterances (Lines 23 - 25) with the claim they support (Line 26) removes the supportive utterances from the relevant discourse context.

I: While R's statement on Line 29 does not directly deny the validity of D's statements on Lines 27 - 28, it does serve as a counterchallenge. There are two types of methods of attack in argumentation, direct and indirect; R has used the latter. If the claim of an indirect challenge (which is usually prefaced with the clue words "Yes/Right but") is accepted, the opponent's argument, by default, is dismissed. Having equated "child's environment before kindergarten" with "child's home," R on Line 29 does not contend D's preceding statements, but rather, claims that she has already addressed herself to it, thereby undermining D's presumed attack.

J: Analogy serves as a valid means of argumentation. Lines 32 - 33 present an analogous claim to the claim on Line 30. By proving the analogous claim, a speaker has implicitly proven the original claim. Lines 34 - 36 serve as proof of the analogous claim.

K: Line 39 is a restatement of Line 30 and Line 40 is a further support of it. (The utterances cannot be a continuation of Lines 37 - 38 because they are of definite modality, whereas the modality of Lines 37 - 38 is hypothetical.)

L: Despite D's intervening use of "they" to refer to "two people," his use of "they" on Line 39 to refer to "the two brothers" is unambiguous, because the utterances containing "two people" and the preceding "they" are no longer in the current relevant discourse context. They are therefore not possible antecedents for this pronominal form.

- o Resumption of the initiating subject of an analogy (Line 39) simultaneously reinstates the initiating utterances as the current relevant discourse context, and removes all analogous and transitional utterances from it (Lines 32 - 38).

M: M's utterances on Lines 41 - 46 similarly entail a discourse pop. Her utterances do not directly further support D's preceding claim or supportive utterances. Rather, they serve as a direct further-challenge to R's claim that a child's home is not to blame for the child's aggressive behavior. The challenge is via attack on R's support of this claim.

1.5 Further details on themes

As illustrated by the analysis sketch just given, the four major themes addressed in this work can be further subdivided as shown in the following outline:

1. Structural Analysis of Discourse

A. Recognizing the correlation between a conversational move and speaker communicative goal. The following are but some types of communicative goals performed in a discourse:

- o Presentation of a claim.
- o Giving support to a preceding claim.
- o Fixing-up previous support of a claim.
- o Giving an analogy.
- o Challenging a preceding claim.
- o Resuming a previous subject of discussion.

B. Recognition that preceding discourse moves can constrain continuing options of development and simultaneously set up certain next moves as most likely. For example:

- o Follow demand for support of a claim with some support for this claim.
- o Follow a challenge with a counter-challenge, which may involve the fixing-up of some preceding made claims and supports.
- o Resume discussion of an initial subject of discussion after having made an analogy to it.

C. Noticing occurrences, and giving explanatory reasons, for many seemingly surprising surface linguistic phenomena. For example:

- o Long-Distance pronominalization is maxim-abiding if the referent of the pronoun is in the current relevant discourse context.
- o Short-Distance nonpronominalization is warranted if the referent is in the currently nonrelevant discourse context.
- o Conversants use clue word connectives in conjunction with different types of conversational moves.

D. Utterances fall into segmented units which are delineated by associated conversational moves. For example:

- o A set of utterances making a particular claim forms a single discourse unit.
- o A set of utterances supporting a particular claim lie in a single discourse unit.
- o A set of utterances serving as an analogy to a preceding claim lie in a single discourse unit.

E. A conversation is a set of hierarchically organized related units of discourse.

F. Units have varying degrees of prominence and influence at different points in the conversation. These degrees of prominence determine the type of reference appropriate to elements of these units, and reflect whether or not the interpretation or generation of succeeding utterances will be in relation to them.

2. Theoretical Framework

A. A theoretical framework for this type of analysis must be able to define the different types of discourse units that we find in conversational speech. Some of the features to be captured by this segmentation should be:

- o The set of utterances constituting the unit.

- o The influential status of the unit at a particular point in the discourse.
- o The type of conversational move, and corresponding speaker communicative goal, served by this discourse unit.
- o An identification of that part of the preceding discourse with respect to which the unit serves a particular goal.

B. The theory needs some formal definition of the different types of conversational moves and relations that can occur in discourse.

3. Abstract Process Model

An abstract process model of discourse capable of either discourse generation or interpretation must be able to:

- o Recognize and manipulate the formal structures constituting a discourse.
- o Reflect a conversation's structure and current status in terms of a discourse model composed of these constructs.
- o Facilitate the dynamic aspects of conversational speech: the manner in which the taking of a single conversational move affects a current relevant discourse context. It must have some formalization and procedures that reflect such effects.

4. Cognitive Modeling

In constructing a theory that addresses itself to the cognitive mechanisms used by conversants in spontaneous discourse, it is important to consider whether such a theory is consistent with other theories of cognitive processing. In particular, the following comparative issues need to be addressed:

- o The process model to be presented in this thesis entails a formalization of one level of cognitive processing involved in discourse generation and/or interpretation. What does this differentiation between different types of analyses and conceptualization say about human cognitive thought?

- o An analysis of extended spontaneous discourse reveals surface linguistic phenomena that contradict traditional theories based on single sentence studies and longer texts artificially constructed. What does this lack of predictive power of such theories have to say on the level of "subconscious" versus "conscious" processing performed in spontaneous discourse?
- o Is the type of focused processing that we find in discourse shared by other cognitive processes? Is it related to notions like "selective attention" and "frame-of-reference" identification?
- o What is the relation between argument structures found in conversational speech and the structures formalized by logicians in their study of valid rules of inference?
- o What is the relation between our use of analogies in discourse and rejections thereof, and our general notions of similarity and contrast?
- o What is the relation between a hierarchically structured organization of discourse utterances and our possible hierarchically structured organization of all cognitive thoughts and tasks?

1.6 Overview of thesis organization

The thesis is organized around the four major themes addressed above. In the next three chapters, I will elaborate on portions of the basic theory of discourse (Major Theme 1) and will present particulars of the formalism, grammar, and correspondence to other other cognitive tasks (Themes 2, 3, and 4) in conjunction with each piece of basic theory. Chapter 5 illustrates how the theory as an integrated whole can be used to formulate rules of discourse reference; Chapters 6 and 7 present a further detailed description of portions of the grammar - with traces of the grammar's operation in modeling pieces of discourse; Chapter 8 presents a brief review and re-characterization of some of the major principles codified in the context space grammar; Chapter 9 characterizes the grammar's distinction between a speaker's communicative goal and underlying psychological intent for saying what s/he does, and draws some major distinctions between this work and traditional concepts of a

"linguistic" theory; Chapter 10 presents a comparison between the context space theory approach to discourse and a number of other approaches to text/discourse analysis; Chapter 11 serves as the conclusion chapter, with a number of remaining issues of the analysis highlighted; and in the Appendices, I present a fuller listing of the grammar, a fuller text of Excerpt 1, and a trace of the grammar modeling generation of large sections of this dialogue.

2. THE BASIC ELEMENTS OF A DISCOURSE

Let us begin with a bit more detailed exposition of the theory of discourse being developed here. The presentation will be broken down into four major sections corresponding to the four major themes of the work: structural analysis of discourse, theoretical framework for the analysis, formal abstract process model of discourse, and the relation of this process model to cognitive processing tasks in general. I will begin with a discussion of some of the discourse phenomena dealt with in this study, and will follow with brief overviews of the formalism and grammar constructed to characterize and model these phenomena. The chapter will end with a general discussion on the nature of the grammar constructed.

2.1 Discourse phenomena

According to the view of discourse being taken here, a conversation is a sequence of conversational moves, where each move serves a particular speaker communicative goal. A conversational move relates to some fixed part of the preceding discourse, and usually results in the creation of a new discourse unit whose relation to preceding units is relatively clear. Prototypical of the types of conversational moves (and hence speaker communicative goals) identified in the work are: Challenge, Support, Further-Generalization, and Shift-Topic¹.

In the sections to follow, a fuller description is presented of a

¹It should be noted that these goals are specific to maxim-abiding thematic conversational development. For example, they do not refer to a speaker's underlying emotive motivation for saying what s/he says. The list of goals identified, therefore, does not include goals like "ingratiate," "befriend," "impress," or "fill a pregnant pause."

speaker's communicative goals, the discourse units corresponding to these goals, a listener's need to identify these goals, and identify the preceding section of discourse to which the goal relates.

2.1.1 Context spaces and conversational moves

In normal usage, a conversation refers to a sequence of utterances that are somehow related to each other. A set of isolated non-related utterances, or isolated non-related discourse units, could not be said to constitute a conversation in its ordinary sense.

Utterances are interpreted in a context. While some aspects of this context may be external to the discourse (such as the relative social status of the participants or entry of a new conversant into the conversation), many aspects of this context are derived from the conversation itself. As a simple example, if automobiles were under discussion and a speaker said, "Yes, a loose hood can be deadly," one would most likely interpret "hood" as a hood of a car, whereas, if the Mafia were under discussion, one would be more likely to interpret "hood" as some type of gangster.

A necessary part of following a conversation is understanding the relevance or relation of the set of utterances currently being generated to what was said before. Understanding this relation necessarily entails understanding the discourse role being filled by these utterances. For example, one must be able to discern whether the utterances are said in challenge of something said before, whether they are in agreement and support, or whether, perhaps, they are tangential to the preceding subject of discourse.

Listeners have to identify the role being served by utterances; without such discernment they are lost, confused, and forced to suspend continued participation in the flow of discourse. Failure of a speaker to make discourse roles sufficiently clear frequently results in a listener's questioning the speaker with something like, "What does this have to do with

what we were talking about?" This type of questioning (which we find in discourse) illustrates the kind of presuppositions that operate in discourse communication: we expect utterances to be related to each other, and we expect speakers to structure their comments in such a way as to facilitate their easy integration into the preceding discourse.

In examining naturally-occurring conversations, one finds that there is a set of standard relational discourse roles that successive utterances play. Knowing this set of roles, and choosing the one (or several) most likely to be developed in the current discourse context enables a listener to integrate a speaker's utterances with preceding ones without undo difficulty.

There are two major discourse roles that an utterance can serve: (1) it can be an embellishment or continuation of a discourse unit currently being developed; or (2) it can begin a new communicative act (or speaker goal) that results in a shift from the discourse unit under discussion. Discourse roles of the latter form will henceforth be referred to as conversational moves. The communicative goal of a speaker in his/her conversational move reflects the functional relation of the speaker's utterances to preceding discourse utterances.

Let us return to Excerpt 1, Chapter 1, to illustrate the importance of functional development and discernment. In the midst of discussing the case of two twins under study, D discusses the fact that he and R share the room they're currently in. We recognize that this discussion supports by analogy D's earlier claim that the two twins though living at home have different environments; therefore, we realize that D's shift onto these new "discourse elements" does not constitute an abrupt end to the preceding subject. One would be hard pressed to say that they understand the relevance or point of D's utterances if they do not recognize this function and goal that the utterances serve to D's preceding claim.

In this thesis, I attempt to characterize a level of discourse structure in which utterances fulfilling a single communicative goal (i.e., constituting a single conversational move), are said to lie in a single discourse unit. These units, I refer to as context spaces.

2.1.1.1 Context space relationships

In this analysis, utterances are grouped into distinct discourse units (context spaces) according to the different communicative goals which they serve. In general, a set of utterances (or a single context space) fulfills a speaker's communicative goal vis-à-vis a particular preceding part of the discourse². For example, a context space may be in challenge, support, or tangential development to something. Usually, this something is not limited to a linearly preceding utterance, nor does it extend to the entire preceding discourse.

For example, in Excerpt 1, M's claim that two children need not be treated identically in the same home serves as a challenge only to R's preceding statements of support which are based on two twins being brought up in a same home. M's statements are not in challenge of D's immediately preceding statements, nor are they in further support of them. In fact, M's statements are not directly related to D's preceding statements at all.

A maxim-abiding discourse is one that can easily be parsed into identifiable speaker communicative goals that are performed in relation to clearly signalled, identifiable, and relevant preceding portions of the discourse.

In order to be able to isolate those particular preceding discourse utterances in relation to which succeeding utterances are generated and interpreted, we segment utterances into context space structures that can selectively be brought in and out of a current relevant discourse context. Utterances within a single context space form a "coherent" whole, and it is in relation to this "whole" that a conversational move is performed.

²Thus, in determining which utterances belong together in a single context space, it is not sufficient to recognize the communicative goal alone, but rather, one must also recognize the something in relation to which this goal holds. If two utterances are both "supports," but the claims they respectively support are not one and the same, then the utterances are not partitioned into the same context space.

2.1.1.2 The structure of a context space

A context space carries along with it a lot of information other than the specific set of utterances said to form the context space, just as the analysis of a noun phrase in a sentence involves more than just a record of the specific words said to form the noun phrase. An analysis of a context space must include a specification of what roles its various parts play in the overall discourse structure, and any relevant features of the space that may interact with "well-formedness" or "maxim-abiding" constraints. Some of the major features of a context space are:

- o an internal representation of the set of functionally-related utterances said to lie in the context space;
- o a marker reflecting the influential status of these utterances at any given point in the discourse;
- o a pointer to the preceding discourse context spaces in relation to which this context space was developed;
- o a specification of just what type of relation was involved.

Just as sentences can be decomposed into agents, predicates, and modifiers, a conversation is decomposable into a set of varying types of interconnected context spaces.

2.1.1.3 Varying influential status of a context space

A major feature of a context space is the influential status associated with it at differing points in the conversation. A context space's influential status distinguishes between the foreground versus background roles that it may play in the discourse. Only context spaces in a foreground role have a "direct" relation to the way that succeeding discourse utterances are generated and interpreted.

For example, in Excerpt 1, after D invalidates R's initial support of her

claim that a child's aggressive behavior is not influenced by his environment, this support is rendered a background role. Once R accepts the rejection, no part of the succeeding discourse is directly related to this rejected support context space.

Thus far, then, I have discussed three major features of a discourse engagement: (1) conversational moves are identified in terms of their functional relation to preceding utterances; (2) the smooth flow of a discourse rests upon identification of these functional relations; and (3) not all preceding utterances are considered in this identification process. In fact, a major part of being able to communicate entails knowing the acknowledged standards and procedures by which to distinguish between those utterances that are yet influential to continued discussion and those that are not.

A major claim of this thesis is that there are conventional standards associated with all conversational moves which yield such identification. These standards are highly integrated with implicitly acknowledged rules for signalling a given type of conversational move [90, 112, 119], and the standardized effects of the move on the influential status of preceding context spaces [49, 112].

2.1.1.4 Focus levels

A major aspect of discerning the point of a speaker's utterances is identification of those elements mentioned by the speaker which play a major role in what s/he is saying. For example, if a speaker relates an episode that took place in a park between Dorothy and a poodle, in order to illustrate that Dorothy is cute, it should be clear that the park in which the episode took place is not in focus for the speaker and is not part of the point which s/he is trying to convey.

Listeners then must distinguish for themselves which elements mentioned are of importance. Thus, not only do entire context spaces vary in influential status, but, in addition, different elements within a single space

vary in influential status. The term State is used to refer to the influential status of a context space as a whole, Focus Level, to the influential status of individual elements within the space.

Surface linguistic signals indicate the type of conversational move about to be performed and its acknowledged effects on the influential status of preceding spaces. In addition, certain surface linguistic forms can signal a particular element's focus level within a given context space. Corresponding to the different means we have to reference an element, we seem to have different possible focus level assignments: a pronominal reference reflects a high focus level; reference by name, a medium focus level; reference by description, a low focus level; and implicit reference, a zero focus level.

An element's focus level is often predictable from the current relevant discourse context and the communicative goal being served by the context space. In the above example, for instance, let's assume that before beginning her/his retelling of the Dorothy-episode, the speaker says, "Dorothy is so cute. Like ..." Given such a preceding discourse context, we know that the episode is being told in support/illustration of Dorothy's being cute. We also know, therefore, that in all probability the location of this episode (i.e., the park) is not of major importance.

Listener's can use such suppositions as to what the current relevant discourse context is, their suppositions on the discourse relation (such as support) that might be taking place, and then predict for themselves what elements are to be in focus. If a speaker's surface linguistic forms correspond to their predictions, the conversation will flow smoothly and the listener will feel that s/he correctly understands the speaker's statements. If, however, the speaker's surface linguistic forms conflict with the listener's predictions, the listener will probably be at a slight loss, and say something like, "I thought we were talking about Dorothy and how cute she is. What's all this about this park all of a sudden?"

In later sections of this work, some specific rules of correspondence between an element's focus level and the communicative goal served by its context space will be presented. In addition, I shall show that an element's

current focus level assignment is contingent upon the influential status of the context space in which it is contained.

At this point, let us turn our attention to some of the formal mechanisms developed to categorize the part of the discourse theory presented thus far. At later points, I will return to the phenomena described above, further elaborate upon them, and then integrate the different aspects of the theory into a cogent whole.

2.2 Theoretical framework

The basic elements of this discourse theory are constructs called context spaces and conversational moves which relate these context spaces to each other. Therefore, I will begin the description of the analysis's theoretical framework with a more formal characterization of conversational moves and context space structures.

2.2.1 Context spaces

Context spaces are formalized in terms of a schematic structure with a fixed number of "slots" à la Minsky [93]. Nine major types of spaces are identified. All spaces, by virtue of their being context spaces, share a number of slots in common. Other slots are particular to the specific type of space being characterized.

One can think of the organizational definition of these context spaces in terms of a network incorporating both inheritance and discrimination net features. They are characterized in much the same way that one defines elements of a "Systemic Grammar." In systemic grammars, the elements of the grammar are all defined in terms of a set of features which "take the form of a series of system networks, where each network represents the choices that

are available to a given constituent type" [50, pg.1].³ So, here, too, the attribution of a specific value to one of the slots of a given context space can define some of its other slots and values.

For example, all context spaces have a Goal slot. This slot specifies a speaker's communicative goal in development of the space, i.e., the discourse role which the context fills. For instance, a context space whose functional role in the discourse is to support a claim of a preceding context space will have "Support" as the value of its Goal slot. As will be illustrated in the subsequent section, the grammar's formal analysis of all support conversational moves entails inferring a standard set of inferential elaborations underlying a speaker's statements of support. All spaces with a support-goal slot, therefore, will also have slots to hold these standard, implicit components of a support move.

Reflecting the fact that the communicative goal of a context space relates to some preceding part of the discourse, and that a given communicative goal can be performed in different ways, an additional slot of all context spaces is its Contextual-Function slot. This slot is a structured entity composed of the following two parts: a Co-Relator slot and a Method slot. The Method slot contains annotation of the specific way in which the corresponding goal has been achieved (e.g., Methods, to be fully explained later, with labels such as "Modus-Ponens," "Modus-Tollens," "Flat Denial," "Emotive-Flat-Rejection," etc.), and in the Co-Relator slot we note that particular preceding part of the discourse in connection to which this relation holds.

To capture the varying influential roles that a context space may play at any point in the discourse, all context spaces also have a State slot. Seven

³The context-space and systemic approaches conceptually overlap on the notions of "functionality" [51] and "slot specification with possible conditions of entry and fillers." The two approaches, however, do not agree on the importance of linear placement. This probably results from "the clause" being Halliday's initial object of study.

different State values have been distinguished in this work; the roles and consequences of these values are discussed in Chapters 3, 4, and 5.

2.2.2 Conversational moves

Twelve categories of conversational moves have been distinguished in this work, each category itself being further subdivided into particular methods of achievement. The moves are described in terms of a formal predicate-calculus-like language. Basic cognitive operations, such as "Infer," "Imply," "Instance," "Exclusive-Or," and "For All," are treated as primitives of the language, and the grammar's generation/interpretation rules are written in terms of such primitive operations and the constituent elements of the grammar.

The conversational moves represent the types of semantic/logical coherence relations holding between utterances of a discourse (*à la* Hobbs [62], Cohen [26], Sadock [117], Reichman [112]). The formalizations are high level and abstract, and can be compared in their content-free form to the formalizations of a formal logic system.

The characterization of the conversational moves in this language explicates the implicit connections between utterances standing in a particular type of relation. For example, let's briefly consider the system's analysis of a Support conversational move:

The system recognizes that common forms of support entail citing an authority for the claim under discussion, and/or stating some state-of-affairs, F, such that there exists some generic support-principle, P, of the form "A Implies B," such that F is an instance of A (or not B), C is an instance of B (or not A), and using some rule of inference such as Modus-Ponens (or Modus-Tollens), C follows from F.

R's support utterances on Lines 1 - 14 of Excerpt 1, provide a good

example of both forms of support⁴. Her authority citation includes the source of the claim (a study), reasons for believing this source (excellent French TV documentary), and R's access to this source (seeing a presentation on TV). Her substantive support can be analyzed as follows (using the abbreviations, C (Claim), F(Fact of Support), P (Principle), M (Mappings between P and C), M' (Mappings between P and F), and LR (Logic Rule)):

C = Not(The aggressive nature of the child is influenced by his environment)
- Not(A)

F = Not(A child's aggressive behavior in kindergarten changed over ten years) - Not(B)

P = IF (A) a person's social interactive behavior is environmentally influenced Then (B) that person's social interactive behavior will change over time

M = ((person's social interactive behavior, child's aggressive behavior))

M' = ((person's social interactive behavior, child's aggressive behavior), over time, ten year duration period from kindergarten))

LR = Modus-Tollens

All supportive context spaces are characterized by slots to hold these pieces of a support move (i.e., Source, Method, Credential, Access, F, P, M, and M'). Thus, the system treats implicit components of a move as important, and as much a part of the discourse, as those verbally expressed. These components are necessary parts enabling a context space (i.e., its contained utterances) to fulfill a given discourse role.

At this point, let us turn our attention to the notion of a discourse

⁴In her support, R relies on the accepted procedure that one can generalize from a study sampling random individuals of a population. Of course, one possible form of challenge against such a support is for an opponent to demand evidence that the subjects of the study are really typical of the general case.

grammar which can embody the type of discourse analysis presented above. This first pass through the grammar will necessarily be cursory in nature, and should be taken as introductory remarks meant to be used as a foundation for subsequent discussion of specifics.

2.3 Abstract process model

The abstract process model being presented here has been designed to act as a generator/interpreter of maxim-abiding, well-formed discourse, and is best thought of as a discourse grammar⁵. The grammar is modelled on Augmented Transition Network (ATN) grammars [142]. While an ATN is not necessarily the optimal framework in which to write the grammar, it is a fairly good one as its control structures of tests on arcs before transitions, actions during transitions, conceptual parallel testing of arcs, and register assignments are the natural requirements of a system attempting to do the type of analysis being performed here.

An ATN network is composed of a set of "states," "arcs," and "registers." In the sections below, each of these elements of the network will be reviewed.⁶

2.3.1 ATN's - States and Arcs

⁵The rules incorporated in the grammar by themselves do not form a complete system of discourse generation/interpretation. Rather, they enable specification of a set of high level semantic/logical constraints that a surface linguistic form has to meet in order to fill a certain maxim-abiding conversational role at a given point in the discourse.

⁶For a thorough overview of ATN's see [8]

An ATN grammar is one whose grammar rules are represented in terms of a network of states and arcs. In Figure 2A, taken from Woods, 1970, a simple ATN for a sentence grammar is presented.

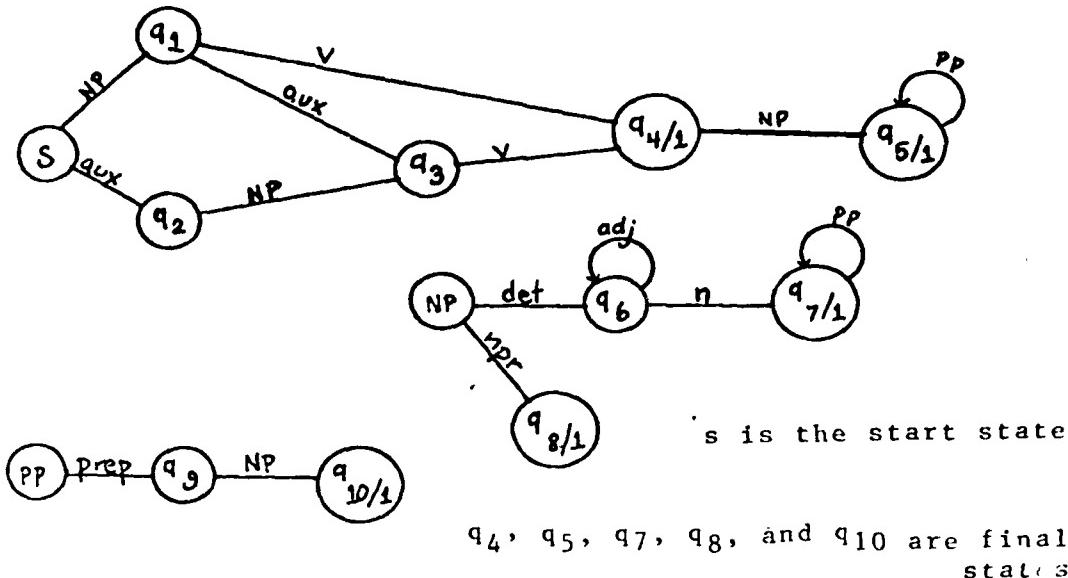


Figure 2A: A Sample Transition Network

Circles in the diagram represent the states of the network, and notations along the arcs represent specific tests which must be true before a given transition may be taken. For example, to go from the start state (S) to state q_1 , it must be the case that we have successfully parsed a noun phrase. Notice that corresponding to the NP stated on the arc between these two states, we have a separate NP state in the grammar which recognizes noun phrases. This test then is analogous to a "push" to the NP state. Successful completion of this test requires that beginning from the NP state, we end up in state q_7 or q_8 of the figure. Once having reached one of these states, we "pop" back to state q_1 .

2.3.2 ATN's - Registers

Not all tests along the arcs in an ATN require a push to another state in the grammar. Some tests merely involve the testing of a register. Registers are used in the ATN grammars as a means of passing values between the states of the ATN, and as a means of controlling transitions along its paths. On any arc between two states of the grammar, any number of register tests may be made to determine whether the current environment warrants or requires such a transition. For example, if we wanted the network in Figure 2A to be able to accept such sentences as "John was believed to be a crook," we would have to begin by changing the network to allow q_4 to accept a past participle verb if the verb in the "Verb" register (i.e., the one put there as an action of the successful traversal of the arc between states q_1 and q_4) is a "be" verb.

2.3.3 The Discourse ATN

Whereas, the word is the unit of analysis in sentence grammars, and complete traversal of a Sentence-ATN, such as the one in Figure 2A, entails the production or interpretation of a single English sentence, the unit of analysis in the discourse grammar is a set of utterances, a single utterance, or portion of one, and complete traversal of the Discourse-ATN entails the production or parsing of a complete discourse. Unlike the case for sentence grammars, however, a discourse grammar does not have a clean beginning and end. Rather, a discourse grammar potentially loops forever around a basic loop that characterizes one conversational move. One enters the start state of the discourse grammar to begin the processing of the first conversational move and usually returns to this same state to begin processing the next one.

As discussed earlier, taking a conversational move often places certain expectations and constraints on possible following conversational moves. Therefore, unlike sentence grammars, on successive entrance to the start state of the discourse network we must have access to a history of previous passes

through the loop. This is handled in the ATN since register assignments set on preceding passes through the system are available on each new pass through it. This provides a system capable of handling extended discourse in which utterances of succeeding conversational moves are semantically and organizationally related to those of preceding moves.

A sentence grammar generally takes transitions on the basis of a few fixed word categories. In general, a discourse grammar is much more sensitive to the logical relationships among successive utterances in the discourse than to their individual "kinds."

The following briefly summarizes this model's use of ATN states, arcs, registers, and actions.

- o States represent the places where we test to see if the current discourse environment facilitates a given thematic development, and where we push to subprocesses that must take place before the current conversational move can be continued or completed. Being in a given state roughly characterizes the decisions and actions performed thus far on a single conversational move.
- o Arcs represent the conversational moves available in a discourse or the component actions of such moves. Just as in sentence ATN's we have arcs for the successive constituents of a phrase, here too we have arcs for the constituent utterances and decision moves of a discourse.
- o Registers are used for two purposes: (1) they represent the basic elements (slots) of a "deep structure" analysis of conversational material, much as the registers used in a sentence ATN represent the basic constituents into which an utterance is broken down; and (2) they are used to track dynamic aspects of the discourse (such as its focus) and to constrain the traversal of paths through the ATN at various points in the discourse. (The register contents often denote specifics of the preceding discourse environment and thus influence the appropriateness of subsequent conversational moves.)
- o Actions on arcs fall into two categories: (1) setting registers and constructing and updating context space constructs; and (2) generating the clue words associated with a given conversational move, and the substantive utterances filling its mode of development.

Register testing on arcs captures the context sensitive relationships

that govern utterances in a discourse. The register testing is comparable to that in sentence ATN's, where, for example, before accepting a past participle verb we first ensure that we have processed a "be" verb. In the case of discourse grammars, register testing plays a much more central role since at the discourse level we have less useful surface category information. In general, the discourse ATN's traversal tests are more complex than those found in sentence ATN's, and usually entail testing of logical relationships between the utterances being generated and those of context spaces in a current relevant discourse context. The grammar uses its registers to point to such spaces.

2.3.4 Updating the relevant discourse context

The grammar is written to model generation⁷ of conversations involving two or more speakers. For each subsequent conversational move the grammar finds a path through its ATN network that first, yields a category of conversational move, secondly, the conversant who will perform the move (i.e., a choice of next speaker - the last speaker may continue to hold the floor),

⁷The analysis captured by the grammar is equally applicable to the interpretive process as well. Its major features of expectations, cues and segmentation are common to both processes. With minor transformations it can be transformed into a parser. For example, all calls on the grammar routine responsible for generation of substantive discourse, called the "Express" function, could be transformed into calls onto a corresponding routine responsible for the interpretation of substantive discourse (and called, for example, "Interpret"). Then, where in the Express function it is stated that a pronominal form can be used for a set of specific entities, within the Interpret function it would be noted that pronominal references should be resolved in terms of this same set of identified entities. Analogously, where a first action along the network path of a conversational move is saying some specific "clue word," in the interpretive version of the grammar, the first test along the taking of such an interpretive path would be the existence of such a clue word.

and subsequently, the paths to traverse for substantive utterance generation. As a conversation progresses, the system updates its discourse model by setting discourse registers and updating the contents of preceding context spaces (i.e., each speaker move results in an update of the system's model). The discourse model includes:

- o the discourse unit under discussion;
- o the preceding unit currently most influential in the discourse;
- o a list of current conversational expectations (e.g., interrupting a discourse unit before completion results in the expectation that the unit will be resumed after the digression);
- o any active domain constraints on the discourse context (e.g., in a debate, once a speaker concedes an argument as invalid, neither speaker can re-use this flawed argument in challenge to an opponent's claim);
- o a history of previously-cited context spaces;
- o the relation of each of these context spaces to preceding discourse context spaces;
- o the State and internal focus-level assignments of all these spaces.

The discourse model reflects a conversation's structured partitioning and development: all context spaces have links to their related preceding spaces and specification of the relation involved.

Discourse model updating is a major requirement of conversational engagement, since the relevant discourse context, in relation to which succeeding utterances are generated and interpreted, continually changes. Each traversal through the grammar cycle represents the taking of a single conversational move, and corresponding to the earlier noted fact that there are standardized effects associated with all moves, the grammar, along its path for a given conversational move, will perform updating corresponding to such effects.

It should be clear that in actual discourse, of course, each participant builds her or his own discourse model, and these models may in fact be in

conflict with one another. The grammar as written does not directly address conflicts. It models each participant following the preceding speaker's conversational move, updating her or his discourse model appropriately. In this way, the grammar is able to simulate the conversation from the perspective of each speaker, building one discourse model as it goes along. In order to model conflicts, the grammar could be amended so that it kept a separate discourse model for each participant. It would then only update a given participant's discourse model retrospectively based on the participant's response to a previous speaker's conversational move. Alternatively, it could be used as a constituent of a higher level of analysis in which the fact that the grammar had two or more distinct parsings was a possible element of analysis. In any case, the structural analysis presented by the grammar can already be used as a way to understand such conflicts (i.e., major elements of conflicts are participants having different State value assignments for preceding context spaces, different context space structuring of utterances, etc.).

2.3.5 Surface structure versus deep structure

In later parts of the thesis, I present traces of pieces of discourse simulated by the grammar, and the grammar's output of such simulations. The traces annotate the network paths traversed in the grammar's generation of the conversation, and the outputs correspond to a "deep-structure" representation of the discourse, in terms of its context space constituents. The Goal and Contextual-Function slots of the context spaces designate their relations to other discourse context spaces, and the State slot provides a running history of a space's differing conversational statuses at given points in the discourse.

A usual ATN network constructed for sentence grammars, similarly produces a trace of an utterance's parse through the system and outputs its underlying structure. In sentence grammars, however, the traces frequently reflect

surface syntactic forms (such as NP VP) while output structures represent an utterance's deep structure in terms of more thematic relations (such as SUBJECT/AGENT PREDICATE OBJECT). In the discourse grammar, there is little such surface-deep structure distinctions. This stems from the fact that in discourse there is not much formal "surface structure," and, hence, the only useful description that can be produced by a discourse grammar is an underlying functional one. This discourse grammar's construction reflects this: from the onset possible paths and states have been written in terms of functionality.

For example, an "issue context space" is a constituent of this grammar. Comparable to an "NP's" ability to serve different functional roles (such as subject or object), an issue context space may serve the different functional roles of "challenging a previously made claim," "setting up a new topic of discourse," "being an analogy to a previously made claim," and the like. For each functional role that an issue context space can serve, different paths leading to the creation of a new issue context space occur in the grammar. Thus, by the time time the set of utterances constituting the issue have been generated, the grammar has already decided its function, and this function is an integral part of the definition of the context space itself.

With these foundations of the grammar and formalisms in mind, we can now begin to discuss the role of such a grammar and use of such formalisms to some general issues of cognition.

2.4 Cognitive modeling

Given that a major aspect of this work is the formulation of a discourse grammar, it seems appropriate to wonder what types of knowledge are incorporated into the grammar, both in terms of a conversant's knowledge of general cognitive operations and wordly knowledge. For example, how does the creation of such a grammar affect the question of whether people have their knowledge structures segmented into discrete routines for distinct cognitive

tasks? What claims, if any, are being made on the "psychological reality" of the specific grammar begin presented here? In the sections to follow a few of these issues will be addressed.

2.4.1 Independence issue

As stated earlier, the rules of thematic coherent development formalized in the grammar are all of an abstract nature, written as a means of characterizing that set of abstract constraints operative in conversational speech. The codified rules are independent of particular speaker/listener beliefs, world knowledge, attitudes, and personal motivations.

While actual use of these rules in conversations is intertwined with any given speaker's world knowledge and beliefs, the rules themselves are in a sense autonomous from specific world knowledge. In this respect, the discourse grammar is analogous to sentence grammars such as a Chomsky style transformational grammar [22]. For example, while an individual may have a whole set of phrase structure rules such as:

```
S --> NP VP  
NP --> DET N  
VP --> V
```

s/he will never be able to generate the utterance, "The machine is broken," if s/he does not have the word "machine" in her lexicon. Similarly, if R had not known any studies supporting the genetic side of the genetic-environmental controversy, she could not have successfully presented a study supporting her side of the argument. This would not mean that she did not have this possible form of argumentation as a rule in her discourse grammar. She simply would not have had any appropriate propositions stored in memory that could fulfill the abstract constraints set on this path.

At a more fundamental level, this work is simply at an orthogonal level of analysis than those which require specifics of world knowledge and belief

structures. The grammar, while in a sense written as a generator of discourse, actually does not characterize all of the information necessary to generate such discourse. It has no knowledge of sentence level syntax, actual words (except for some discourse connectives, i.e., "clue words"), or everyday affairs. It generates via a function call to an abstract procedure "Express," that specifies a set of semantic/logical constraints which surface linguistic forms have to fulfill in order to fill certain conversational roles at given points in the conversation. These constraints are specified in terms of slot fillers of preceding context spaces, and certain basic cognitive operations (procedure calls) such as "Infer," "Instance," "Exclusive-Or," and "Imply," which are considered primitives of the system. Presumably, to determine whether, for example, "A Instance B," is true, necessitates calling/accessing specific world knowledge beliefs. This level of detail and analysis is considered orthogonal and separate from the endeavor being undertaken here.

Thus, it is not being denied that perhaps frames (à la Minsky [93]), scripts (à la Schank&Abelson [118]), schematas (à la Bartlett [7]), belief systems (à la Austin [6], Searle [124], and Grice [45]) and semantic networks (à la Collins&Quillian [28] and Collins&Loftus [29]), and the like, are probably needed and utilized by a discourse grammar. The point here is simply to illustrate how the complex process of conversation generation can be decomposed into a number of separate cognitive activities. This work is intended to show that there is a characterizable set of independent discourse processing rules, and to specify them in terms of an abstract process model of discourse generation. These rules are at a level above actual production and can be specified without access to individual speaker beliefs and their separate knowledge structures.

Furthermore, despite all of one's particular beliefs about another individual, there are some general beliefs about language form that we assume all (or at least most) participants in our language community share. It is based on this fact that we can have effective communication with people of this language community that we've never met before. These assumed shared rules of language form, direct, constrain, and impinge upon the structures we

use in conversing. So, for example, my particular beliefs about a person are not what causes me to say, "I went home at ten," rather than "Went home at ten I." Analogously, the rules presented in this grammar characterize those rules of discourse form that participants in our language community share, whether they be hostile, aggressive, or wonderful people. So, for example, despite any personal beliefs that D may have about R, when R utters Line 29 (Excerpt 1), an utterance of the form "Right, but, X," D expects the utterance to be an indirect challenge of his preceding statements.

There are, however, a set of beliefs and structures that seem to be at the same conceptual level of analysis as is the work being presented here, and which could be incorporated into it or could equally be kept separate. These are ones dealing with the dynamic social-psychological factors that are brought into play in the choice of "what to say next." For example, issues of social peer relationships, assertive/nonassertive behavioral traits, depth of knowledge on a given subject matter, and beliefs about another conversant's attitudes and consciousness all affect what a conversation participant may say. These factors could be considered to be a separate operative module, or they could be incorporated at a later stage in the development of the grammar as probabilities that a speaker will choose a specific path in the grammar. For example, we could include the probability that a meekish type of person may be more likely to choose an indirect form of challenge rather than a direct form in argumentation.

2.4.2 The language faculty

Does a grammar have "psychological reality" or is it just a useful abstract tool in a linguist's head alone? In agreement with Chomsky [22] I support the hypothesis that individuals do have a modularized process (grammar) for language production and comprehension. It need not follow, however, that this language faculty does not share many of the cognitive structures used by other systems in the mind. Specifically, this discourse

grammar (a version of which I consider to be a mandatory part of any language faculty) is written in terms of the many cognitive structures and functional abstractions that humans employ for varied reasons: generalization, instantiation, implication, presupposition, focus, etc. Within the grammar we have specific points at which calls are made to such structures. As Chomsky suggests [23] it is yet an open question as to what should fall under the language faculty and hence appear in some form in its representations of meaning. The claim here is that many of these non-language-specific operations are used in the domain of the language faculty; they form the basic operations in terms of which we can formalize the abstract language rules governing conversational speech. This sharing of cognitive structures between separate systems seems quite reasonable, since one would expect the mind to be equipped with a basic set of cognitive operations. The modularity involved, then, is the specific orderings of such operations in the fulfillment of different tasks.

2.4.2.1 Psychological reality

It must be made clear that no claims are being made about the psychological reality of the specific grammar being presented here, though, one does feel that an individual's discourse grammar would be structured in terms of the basic analytic apparatus presented earlier (context spaces, context space relationships, state and focus level assignments). Furthermore, this work demonstrates that tracking a conversation's changing "relevant contexts" and the changing constraints and demands placed on conversants is a basic, mandatory component of such a discourse process, and that such tracking can effectively be performed in terms of these specified structures. However, one can only speculate as to how this process is actually accomplished in the mind.

Bolt Beranek and Newman Inc.

Report No. 4681

3. SO HOW DO WE SEGMENT AND INTERPRET UTTERANCES?

The analysis presented here is based on a structural decomposition of a discourse into a set of functionally related context spaces. Let us therefore further investigate where context boundary points lie, and how listeners determine such boundary points. In the discussion, it will become clear that major determining elements of boundary point demarcations are a listener's identification of a current relevant discourse context and his/her assumption of the communicative goal underlying a speaker's utterances.

3.1 Discourse phenomena

3.1.1 Context space boundary points

Taking a conversational move usually corresponds to fulfilling a distinct communicative goal and hence usually warrants a shift from the context space under current discussion. Normative preconceptions of what would likely fill a single context space or constitute a single conversational move might be: (1) The sequence of utterances stated by a single speaker on a single conversational turn, and (2) the set of utterances referring to a single object under discussion (e.g., the discussion of an episode that took place sometime in the past, contesting claims on whether or not a particular person performed some action, etc.). These preconceptions are incorrect however.

3.1.1.1 - Speaker shifts

Analysis of natural dialogues reveals that there is no direct connection between a speaker's single turn (or speaker shifts) and performing a single conversational move. For instance, in the genetic-environmental debate of Excerpt 1, D performs seven conversational moves on a single turn: (1)

stating an analogy as a means of supporting an earlier claim; (2 & 3) supporting the claim of the analogy with two examples; (4) stating the abstract principle under which the analogy and supports hold; (5) supporting this abstract claim, (6) resuming the initial subject of discussion (i.e., the initiating claim of the analogy); and (7) giving further supportive evidence of this initial claim.

3.1.1.2 - Referent dependence

There is also no a priori fixed relation between conversational moves and the referent of things being described. For example, the telling of one episode need not be limited to a single conversational move. If, for example, parts of an episode illustrate topic A (e.g., by being a set of events that culminate in an instantiation of the generic event stated in A), and other parts of the episode illustrate topic B (in a like fashion), then a full discussion of this episode with specification of both sets of events, would entail performing two conversational moves, reflecting the different functionalities of the utterances involved (despite the fact that the sets of utterances both refer to events of a same episode).

In the generation of maxim-abiding discourse, a speaker's communicative goal in the generation of a set of utterances should be clear to a listener. In terms of the above, for instance, the spewing out of all events that occurred in an episode being retold, is "unco-operative" as it makes it difficult for a listener to determine the specific point, or communicative goal, of the narrative. As expected, when we look at actual discourse generation, we do not find all events of an episode being stated, but rather, we find a description of an episode to be limited to a specification of only those events needed to illustrate one particular point.

Thus, while in some sense many events "belong together" as they have occurred in succession in one location, it is not the case that they then necessarily belong together in a given discourse context. In fact, when a set of events illustrating a new point of an episode is brought up, we find

speakers clearly indicating this to listeners in their surface linguistic forms. For example, they will preface their specification of these other events with such clue words as "Incidentally," or "By the way," and preface the return to the initial communicative goal with something like "Anyway," or "Getting back to my first point."

Keeping the above in mind, we can now restate Grice's maxim on "Quantity" somewhat more precisely:

Quantity: In the development of a context space, only specify those aspects of the referent being discussed that are needed for the fulfillment of the one specific communicative goal of this context space.

For instance, in the "orientation" section of a narrative, only specify those predication on a character that are needed to understand the role played by this character in the events described. And, in the specification of the "body" of the narrative, do not describe events that are not needed to enhance the understanding of the point of this episode. For example, if you are telling a story to illustrate and/or support a preceding claim, only specify those events of the episode that are necessary as a "lead-to" the particular event that is an instance of the generic proposition being supported. For instance, do not tell us whether you were drinking coffee during the episode if your coffee drinking did not in some way cause the event of the episode that reflects its point.

Now, what particular descriptions of a subject enhance fulfillment of a particular communicative goal, is determined by the discourse context in relation to which this communicative goal is being performed. This corresponds to the previous observation that a communicative goal is vis-a-vis a particular preceding section of discourse. So, for example, a support move of a claim about "heavy coffee drinkers" warrants the retelling of parts of an episode that deal with coffee drinking. On the other hand, for example, if the claim being supported is about the importance of dreams, as it is in Fran's piece of dialogue in Excerpt 2 below, then, discussion of any coffee

drinking that took place in the episode is tangential and irrelevant to the point of current discussion.

Excerpt 2

Fran: 1. I'm starting to, you know, to get more insight about
2. dreams. And, they're so revealing about where you're
3. at. They really are.
4. Like Susan and I spent an hour the other night just
5. dissecting her dream.

Chris: 6. I know. I should write them down.

Fran: 7. And she wrote it down, and when I read it I saw new
8. things into it. And, it was just so interesting.
9. And, it really reflected so much of were she's at in
10. therapy and everything.

It is in terms of a currently relevant discourse context that one determines what belongs where. It is clear then that a major part of following a conversation is identification of the constituent elements of this relevant discourse context.

3.1.2 The constituents of a discourse

Many aspects of discourse are mere macrocosms of the phenomena found in single sentences. In order to discuss the constituents of a discourse, I, therefore, for the moment, turn to its analog in the constituent structuring of single sentences.

It is common knowledge that sentences are decomposed into noun and verb phrases, each of which in turn is further decomposed into its constituent parts. A noun phrase, for example, is said to be composed of a head noun and its modifiers, while a verb phrase, is said to be composed of a main verb and its modifiers. Now, in the interpretation process of a single sentence, given that a noun has just been processed and a relative clause is begun, listener's have no difficulty in recognizing that the relative clause is to be interpreted in the context of this preceding noun. Similarly, having

processed a verb, we have no difficulty in recognizing that a succeeding adverb is to be interpreted in relation to this preceding verb. The constituents of a discourse, similarly, are processed in the context of their co-constituents.

In addition, it is well known that some subconstituents of a complex constituent are independently interpretable and can appear without the accompaniment of other subconstituents. For example, we can have a verb without an adverb and a noun without a relative clause. Some subconstituents, however, necessitate the presence of other subconstituents for their interpretation and "legality" of presence. For example, we can not have a relative clause without having the noun that it modifies, nor can we have an adverb without the verb that it modifies⁸.

Similarly, in discourse, some types of constituents can appear in isolation, while the appearance and interpretation of others are contingent on the presence of some other constituent. For example, we cannot have purported statements of support without the presence of a claim to be supported, nor can we have a context space serving the role of analogy if there is nothing to which it is an analogy.

A major element of the context space theory's analysis rests on characterization of constituent and subconstituent discourse phrases, and distinguishing between dependent and non-dependent constituents. Given a dependent subconstituent phrase, for example, the grammar knows that this phrase should be interpreted in direct relation to its superordinate constituent. This greatly aids the grammar in its identification of a relevant discourse context at any given point in the conversation.

An Issue context space is a major non-dependent discourse constituent. Issue spaces act as "topic-setters," and generally contain assertions that a given state-of-affairs is good/bad, true/false, possible/not possible, etc.

⁸I am of course referring to single sentence interpretation at the moment; excluding therefore elliptical utterances and the like.

The state-of-affairs referenced in the assertion usually becomes a topic of discourse. Developing this topic consists of, for example, supporting the assertion, challenging the assertion, discussing contingency factors of the assertion, etc. Developments of the above form, constitute developing subordinates of an issue context space.

In general, proper interpretation of a subordinate necessitates identification of the issue space of which it is a subordinate. In this sense, issue context spaces are the discourse analogs of sentential "head nouns" and "main verbs." They can stand alone, but their "modifiers" cannot. They are the "cause d'etre" of a conversation at given points in time. They tell us what the topic of discourse is; explain why new utterances are being generated; and provide the context in light of which sub-parts of the discourse can be processed.

For example, to get the point of Fran's story in Excerpt 2, one must use the issue context space developed on Lines 1 - 3 of the excerpt. For instance, in isolation, one could conceivably say that a generalization of any one of the story's described events could be its topic. However, as the narrative appears in this particular discourse context at this particular point in the conversation, it seems pretty obvious that one would not take as its point the fact that "Susan and Fran spend time together," that "Susan's in therapy," or that "Some people write their dreams down and then some people dissect them." The natural interpretation would be: "Here's an example of a dream being revealing about a person, and Fran's new ability to see this." Namely, its point is basically just what Fran told us it would be on Lines 1 - 3, before she even began the story.

Fran's statements on Lines 1 - 3 function in a manner similar to paragraph "topic sentences"⁹. They differ however from such topic sentences

⁹Polanyi [105], Jefferson [68], Labov [77], and others, refer to such "story topic sentences" as "story abstractions," which they claim preface most stories and which should therefore be considered a part of the story structure itself. This works goes further and claims that all discourse subconstituents have such accompanying "topic setters" which provide the needed context for their interpretation.

in that within a given paragraph a topic sentence and the remaining part of the paragraph are usually of the same tense and speak of the same things. That is, it is usually the case that succeeding parts of the paragraph serve as further-embellishment of the topic sentence. Lines 4 - 10 of the excerpt, however, are not mere embellishment. A new time frame is introduced and so are new characters. In fact, using the paragraph metaphor, these two sets of utterances probably do not even belong in the same paragraph. And, correspondingly, in our context space structuring of this excerpt, Lines 4 - 10 are partitioned into a separate context space than that of Lines 1 - 3.

3.1.3 Focused processing

Let us return to the analog between discourse interpretation and sentence interpretation. Given the utterance "The man whom Dorothy adores committed a vile murder," we have the relative clause "whom Dorothy adores" modifying the head noun "the man." Given the utterance "The man whom the girl threw into the water who was a murderer left today," it is somewhat unclear which noun the relative clause "who was a murderer" modifies. That is, is the girl who threw the man into the water a murderer, or is the man whom was thrown into the water a murderer?

While it is somewhat ambiguous which head noun the relative clause modifies, it is accepted procedure that it is taken in modification of only one of the phrases.

Similarly, in discourse, thematic and relational development of a subordinate context space is in direct modification of only one preceding space. Thus, though, at times, it may be unclear which preceding space is being modified, it is quite clear to all that only one of the spaces is meant to be modified. For example, given that five tangentially related discourse subject matters were brought up in a discourse¹⁰, in examining naturally

¹⁰Where for each distinct discourse subject a separate context space would have been developed.

generated conversation, one never seems to find succeeding utterances simultaneously directly related to more than one of these previous diverse discourse topics.

For example, let's assume that the following utterances preceded Fran's statements in Excerpt 2.

Excerpt 3'

Fran: 1': I was speaking to Susan a couple of weeks ago and she
2': told me she started therapy.

Chris: 3': Yeah, I know. She seems real pleased with it. She
4': thinks it's already helping her get in touch with
5': some of her underlying emotions.

Fran: 6': You know, there are really lots of different ways of
7': experiencing emotions. I mean, you don't even
8': necessarily have to be consciously aware of them. I
9': mean, you could dream about them for example.

1: I'm starting to, you know, to get more insight about
2: dreams. And, they're so revealing about where you're
3: at. They really are.
4: Like Susan and I spent an hour the other night just
5: dissecting her dream. ...

Even given this preceding discussion of Susan and therapy, and the possibility of seeing Fran's story as evidence that therapy is having an effect on Susan's emotions (i.e., as reflected by Susan's dreaming about it, since dreams are considered a means of emotive expression), I think it quite unlikely that anyone would now find the point of Fran's story different than the one initially proposed. Why is this? Why are some preceding utterances considered in the interpretation of succeeding discourse utterances while others are not? Why wouldn't we in the midst of this conversation take Fran's story to be simultaneously addressing both preceding discourse topics?

The answer seems to lie in the fact that we do not merely remember a list of utterances, we segment them into groupings that "cohere" and which selectively are brought into highlighted focus. Such a grouping of utterances

is clearly reflected when we, for example, lose our place in the conversation and ask, "Well, how'd we get to be talking about this?" followed by a sequence of recalling topic descriptions and points discussed. Each such topic description apparently corresponds to a particular distinctly developed context space in the preceding discourse.

3.1.3.1 Which preceding context space to choose?

In general, utterances which refer to distinct assertions, actors, time frames, locations, and the like [20, 112, 48, 88], lie in separate context spaces. Thus, Lines 1' - 5', Lines 6' - 9', Lines 1 - 3, and Lines 4 - 5, of Excerpt 3', all lie within separate context spaces. As stated above, however, the interpretation of succeeding discourse utterances is done in terms of only one preceding context space. In this case, the single context space chosen for the interpretation of Fran's episode is the last active issue context space discussed, whose claim this narrative-support space supports.

While in Excerpt 3', the context space chosen as the relevant context for interpretation is an immediately preceding one, in general, linearity does not play a major role in such context identification. For example, as illustrated in Excerpt 1, a speaker's utterances often is not related to immediately preceding ones, re M's last challenge in the genetic-environment controversy of Excerpt 1, which was not directed against D's preceding utterances, but rather, against R's utterances that were made previous to D's statements.

As noted earlier, the context space chosen in aid of interpretation is usually one in conjunction with which the context space being developed forms a constituent whole. However, as in our ambiguous single sentence case above, it is possible for there to be more than one preceding context space to which the current context space can be attached to form a larger constituent. As will be detailed in a later chapter, depending on the discourse flow different preceding context spaces are deemed the most influential at a given point in the discourse; and from the set of potential "combiners," the context space chosen is the one of most influential status.

There is, however, an additional mechanism that aids listeners in their choice of the preceding context space in direct relation to which they interpret succeeding utterances. This mechanism is also found in sentential processing and it refers to the fact that the presence of a preceding constituent is often predictive of ones to follow. I call this predictive element in discourse, discourse expectations.

3.1.4 Discourse expectations

Looking at sentential processing, we know for example that given the presence of an intransitive verb, we expect a noun phrase functioning as object of this verb to follow. Or, for example, given any type of verb, one considers it likely or feasible that an adverb will follow. Similarly, in discourse, given a challenge of a conversant's remarks, one often expects the challenged conversant to respond with a counter-challenge. Given that discussion of a particular subject is suspended and a digression ensues, one correspondingly, generally, expects the initial, interrupted subject to be subsequently resumed and completed.

Analogous to Grice's notion that some conversational moves are "unsuitable" at a given "stage" of the discourse, I would add that at certain stages, some conversational moves are "expected" and "most appropriate." In addition, then, to a conversational move taking us to a new "stage" of the discourse and having standardized effects on the influential status of preceding discourse context spaces, conversational moves also set up certain expectations of what types of moves will follow them.

Discourse expectations not only specify a type of move to follow, but, in addition, they specify the particular preceding context space in relation to which such a subsequent conversational move will be taken, and the speaker expected to take this move. For instance, the specific context space interrupted will be resumed; the specific context space serving as a challenge will be counter-challenged.

Listeners can use these discourse expectations when they attempt to interpret a speaker's utterances. They know what type of conversational move is expected, and they know to what particular section of the preceding discourse this move is directed.

Let's now turn our attention to the formalisms designed to capture some of these noted discourse phenomena.

3.2 Theoretical framework

In this section I will delineate the formalisms constructed to reflect that: (1) some context spaces are subordinates of others; (2) the communicative goal of a space is in direct relation to only one preceding space; and (3) conversational moves create discourse expectations of moves to follow.

3.2.1 Subordination of spaces

To accommodate context spaces interrelating with each other to form "larger wholes," context spaces may, as slot fillers, point to other context spaces. To reflect the distinction between dependent and independent spaces, independent spaces have as slot values their corresponding depending context spaces, rather than vice versa.

As noted earlier, issue context spaces can stand alone, but they do form a constituent relationship with supportive context spaces that support the claim contained in the issue space. All issue context spaces therefore have a SupportCS slot that points to all the supportive context spaces developed in subordination to it.

3.2.2 Focused processing

During the development of a subordinate context space, the preceding context space of which it is a part is considered the preceding space of most influential status. And, it is in direct relation to just this one preceding space that the utterances of the subordinate space are interpreted and generated.

Corresponding to the fact that we have such directed and focused processing in discourse, all the formalized generation/interpretation relational rules in this thesis are written in terms of relating the utterances being generated to the context space under current development and to the one preceding context space in the discourse environment with the highest influential status.

To be able to identify this highest influential status context space we use the State slot associated with all context spaces. A value of Controlling in this slot denotes that the associated context space is the one of highest discourse influence, a value of Active, denotes that the context space is under current discussion.

We can now restate some of Grice's maxims for discourse in terms of these formal constructs:

Relevant Discourse Context: At any given point in time, a relevant discourse context is said to be composed of two context spaces: a) the context space currently being developed, i.e., the active context space; and b) the preceding context space in direct relation to which the active context space is being developed, i.e., the controlling context space¹¹.

Relevance: To be relevant means either a) to embellish the active context space by stating a succeeding utterance that fulfills the same

¹¹One should not however infer from this that all other preceding context spaces play no further role in the continuing discourse development. This point will be further developed at a later point in the thesis.

communicative goal as the preceding utterances contained in this context space, or b) to begin the development of a new context space whose communicative goal (as formulated by the set of possible conversational moves) vis-à-vis a preceding context space is clear. Before generation of subsequent utterances, the preceding space will be re-established as controlling.

3.3 The Discourse Grammar

As noted in the discussion of Grice's maxims, taking one option of discourse development can preclude the later taking of previously available options and more easily facilitate the taking of others. A discourse grammar then must have:

- o some means of knowing how the taking of one option affects succeeding possibilities of development;
- o some means of reflecting these effects in its model of the discourse, so that the effects can appropriately constrain the grammar's succeeding discourse processing.

Taking a developmental option corresponds to performing a particular type of conversational move. Therefore, along the grammar's network path for each conversational move, it should be updating its discourse model corresponding to the effects of the type of conversational move being processed.

There are two major means by which the grammar performs this updating: (1) updating the State values of preceding context spaces; and (2) setting discourse registers. Below, I detail each of these facets of the grammar's updating process.

3.3.1 Updating State assignments

An important feature of the grammar's discourse model updating is its

reassignment of the State values of preceding context spaces. As discussed, most of the grammar's rules responsible for the processing of substantive utterances are written in terms of high level semantic/logical relationships between the utterances being generated (i.e., those being put into the active context space) and the utterances of the controlling context space. At all times, then, the grammar must have a handle on that particular preceding context space whose state is controlling. This usually necessitates continual updating of the State assignments of preceding spaces. For example, let's reconsider Lines 29 - 40 of Excerpt 1, repeated below.

Excerpt 1

R: 29. Right, but, the two brothers have the same environment.

D: 30. They do not have the same environment.

R: 31. Why not?

D: 32. Because you and I are very close in this room right
33. now but we don't have the same environment.
34. Because I'm looking at you, I'm seeing that window
35. behind you, you're not seeing that window behind you.
36. You are not looking at you, I am doing it.
37. Two people can't be in exactly the same place at the same
38. time, otherwise, they'd occupy the same space.
39. They do not have the same environment.
40. They don't have the same friends.

As noted earlier, supportive and issue context spaces form a discourse constituent, and the interpretation of a supportive context space is done in the context of the issue context space that it supports. To reflect this, during the development of a supportive context space, its correspondent issue context space's State value is controlling.

Now, in the excerpt above, D says Lines 34 - 36 in support of his claim on Lines 32 - 33, and he says Line 40 in support of his claim in Line 39. Thus, during generation of Lines 34 - 36, the context space containing Lines 32 - 33 must be controlling, and during generation of Line 40, the controlling context has to be the space containing Line 39. Clearly, then, interveningly, the grammar must perform some State assignment updatings.

It should be apparent that the grammar must use the same rules of generation over and over again. It can however do this only if the rules are written in terms of some registers which themselves are updated before each application of a rule. In particular, the grammar needs a special register to point to the context space in a controlling state. This register is called the HEAD-CCS register. The grammar's generation rules are written in terms of HEAD-CCS; and the grammar continually updates its value on succeeding passes through its generation cycles.

3.3.2 Updating of registers

3.3.2.1 The HEAD-CCS register

Most of the grammar's rules of substantive utterance generation are written in terms of the HEAD-CCS register. For example, the following is the grammar's representation of constraints that must be met for an utterance, P, to fulfill a Modus-Pollen-Support conversational move vis-à-vis the claim in a current controlling context space:

Speaker EXPRESS some Proposition, P,
S.T. POSSIBLE(INFER "If-Then-Principle", ITP)
S.T. P INSTANCE Not(ThenPart(ITP))
 &
 HEAD-CCS.Claim.State-Of-Affairs
 INSTANCE
 IfPart(ITP)

Notice, that as long as the HEAD-CCS is appropriately updated by the time this rule is processed, the rule is applicable in any number of places in a given discourse.

Two equally important registers in the discourse grammar that need to be updated along the grammar's processing of particular conversational moves, are the Expectation and Expectation-List registers.

3.3.2.2 The Expectation register

As noted and illustrated earlier, taking a conversational move often sets predictions on the type of moves to follow. For example, it was claimed that when a conversant's claim is challenged, it is usually expected that the challenged conversant will respond with a counter-challenge to this challenge. It has also been illustrated that a conversant's demand on another to support a claim is usually followed (in cooperative discourse) by the questioned conversant giving the requested support. Numerous other examples of expected behavior have been mentioned as well: expected resumption of the initial subject of an interrupted context space; expected resumption of the subject that initiated an analogy; and the expected further-challenging of an opponent's preceding claim in a debate.

Notice, that all these discourse expectations result from the previous taking of a particular type of conversational move. Along the grammar's path for each such move, then, the grammar appropriately sets up these discourse expectations. For example, along the grammar's path for a "Challenge" conversational move, the grammar will set up the discourse expectation that the conversant being challenged will respond with a counter-challenge.

A preceding conversational move not only sets up the expectation of a particular move to follow, but, in addition, as illustrated above, it sets up the expectation of who will perform this move, and it cites the context space to which the move applies.

The register used to create such discourse expectations is called the **Expectation register**. Corresponding to the fact that discourse expectations carry along with them the above interrelated information, the **Expectation register** is defined in terms of the following four constituent parts:

- | | |
|------------------|--|
| Function: | A state in the grammar which corresponds to a conversational move category |
| Speaker: | The conversational participant expected to carry out this discourse move |

Context: That context space that will most likely be active or controlling during the processing of this conversational move

Associated-Constraints:

Specifies the constraints that have to be met when this expectation is fulfilled, if any (e.g., giving a requested support)

3.3.2.3 The Expectation-List register

While a preceding conversational move often predicts a move to follow, it is not necessarily the case that the prediction is limited to one move, or that the predicted conversational move will take place immediately (or even at all). For example, as illustrated in Chapter 1, a challenge conversational move sets up both the predictions that the challenged conversant will respond to the challenge with a counter-challenge, and that the challenger will give further challenges beyond his or her initial challenge. After the antagonist's challenge move, either of these two predicted moves are feasible. Alternatively, a digression could take place, forestalling the challenged conversant's immediate response to the challenge given.

Due to this range of possibilities, we must somewhere keep track of discourse expectations, and delete them from remembrance only when they are no longer viable (e.g., ending a debate would result in the removal of all "Challenge" and "Further-Challenge" move predictions). The discourse register in which the grammar keeps a running history of discourse expectations that can be taken up at later points in time is called the **Expectation-List register**; it is a list, in sequential order, of all expectations set up and viable in the current discourse context.

On each successive return to the start state, the grammar has the option of choosing an outstanding discourse expectation. Choosing an expectation results in this expectation being deleted from the list of outstanding expectations (noted in the **Expectation-List register**) and its being put into the **Expectation register**. Control is then passed to the grammar state noted in the expectation (i.e., `Expectation.Context`), wherein further discourse

model updating, as predicted by the information contained in the expectation, is performed (i.e., likely reassignment of Next-Speaker to Expectation.Speaker, readjustments to the states of preceding context spaces, in particular resetting Expectation.Context to Active or Controlling). Specific examples, and details of the grammar's processing of such expectations, is presented in later chapters of this thesis.

3.4 Cognitive Modeling

The above mentioned rule of having the interpretation and/or generation of utterances of one context space being in direct relation to only one preceding space, is intended to mirror the type of focused processing that we find in natural discourse. This focused processing seems to reflect a mode of thinking oriented toward concentrated thought on only one of a few highlighted related items at any given point in time. It seems to suggest that our cognitive processes are not attuned to remember disparate entities in short term memory and simultaneously work on them. It is the discourse correspondent of "selective attention."

The following are but some discourse phenomena reflecting discourse focused processing: (1) There seems to be only one current discourse topic at a given point in time. (2) While from any given point in the discourse there are a number of open lines of future development, typically, only one line of functional and thematic development is chosen. It is probably safe to conjecture that an attempt at simultaneous option fulfillment would be perceived either as an ambiguity or go unnoticed. (3) We seem to continuously update the status of preceding discourse utterances so as to highlight a specific set of utterances while unhighlighting another set, as reflected by our use of such clue words as "But," "Anyway," "Incidentally," and corresponding continued pronominalization or nonpronominalization to elements of preceding context spaces. This unhighlighting phenomenon is further reflected in the fact that after following one option of development, other

options previously available, no longer seem viable. (4) Focused processing is further mirrored in the fact that we even seem to limit discourse pronominalization to a specific single entity considered to be in the highest focus in a relevant discourse context.

In general, simultaneous achievement of more than one discourse function by a given set of utterances (i.e., by having them simultaneously directly related to varying discourse topics and serving varying discourse communicative goals), is considered to be a "creative" use of language. That is, it is not considered the norm or typical of how we ordinarily use language. We even have special descriptive terms for such occasions: allegory, pun, play on words, double entendre, etc. These terms reflect that here we have distinct genres, perceptibly different both in form and frequency from the ordinary.

Even in these creative discourse forms, it is questionable if we can simultaneously process these utterances in terms of their multi-functionality. Consider for example the allegory. I think one might agree that the processing of the "story" of the allegory is qualitatively different than our processing of an ordinary narrative in discourse. To actually listen to the events specified as a "real" story, probably would entail losing hold of the allegory being told. At minimum, it probably necessitates some conscious "shifting" between the two modes of interpretation, similar to the "shifting" needed to "simultaneously" see the two views of a Necker cube.

Bolt Beranek and Newman Inc.

Report No. 4681

4. FURTHER DETAILS ON CONVERSATIONAL MOVES

The theoretical analysis of discourse being presented here is one based on the supposition that we can formalize and characterize a conversation into a set of related constituent parts. It has been asserted that these parts, called context spaces, are created by conversants as they generate utterances that are formally and organizationally related to the preceding discourse.

The claim is that one can characterize and specify a specific set of standard thematic relationships that utterances (or context spaces) have with one another. A listener's interpretation of a speaker's utterances is facilitated by a listener's (1) accessing this standard set of relations; (2) knowing which relations are most likely to occur at a given point in the discourse; (3) having an up-to-date handle on the current relevant discourse environment; and (4) noting specific surface forms used by a speaker.

In this chapter, I would like to more fully address each of these component parts of a listener's process of discourse interpretation. I begin by listing and describing a set of standard relational roles that context spaces serve and their corresponding linguistic introducer forms. This is followed with a description of the formal structures created to represent these relations, and the grammar's updating actions for relevant discourse identification (corresponding to the implicitly recognized effects of each move on the influential status of preceding context spaces). The chapter ends with an attempt to use some of these findings as a means of shedding light on some "cognition" debates currently being discussed in the literature.

4.1 Discourse phenomena

A close analysis of spontaneous discourse, reveals that speakers use specific surface linguistic connective signals, which I have called clue words, in connection with many of the different types of conversational moves

that they perform. These clue words signal that a context space boundary point has been reached, and, correspondingly, specify the type of shift about to take place. In the list below, I present the clue words¹² recognized by the grammar, and the grammar's knowledge of the conversational moves¹³ associated with them.

<u>Clue Word</u>	<u>Conversational Move</u>
1. Like	Support
2. Like when	Support
3. Because	Support
4. So	Restatement of point being supported
5. Incidentally	Interruption
6. By the way	Interruption
7. Anyway	Return to previously interrupted context space
8. In any case	Return to previously interrupted context space
9. Yes/Right but	Indirect Challenge
10. (No) But	Direct Challenge
11. All right/Okay but	Concede Subargument
12. But look/listen/you see	Prior Logical Abstraction

¹²Elements in parenthesis indicate optionality.

¹³It should be noted that the descriptive labels cited refer to category names. For example, one of the moves categorized is the "Direct-Challenge" move. The grammar actually recognizes many different types of direct challenges. In later chapters of the thesis, I present some of the different particular types of challenges that the grammar recognizes. For current purposes, however, discussion of categories as a whole suffices.

- | | |
|---------------------------|-----------------------------|
| 13. But ... (though) | Contrastive Respecification |
| 14. It's like/the same as | Analogy |
| 15. Now | Further-Development |

Details of what is meant by the descriptive labels above, and their occurrence in actual discourse (accompanied by their associated clue words), is presented in the sections to follow.

4.1.1 Because/Like/Like when: Support

As stated earlier, in order for a fact, F, to support a claim, C, it is usually the case that there is some generic principle, P, such that P applied to F yields C, using some rule general rule of inference (unless of course the support just entails the citation of some authority, e.g., "I read C in a book," "Harry told me that C is true," "I just know that C is true," etc.). For example, let's reconsider some of D's statements in the genetic-environmental debate excerpt presented in the Chapter 1 and repeated below.

- D: 32. You and I are very close in this room right now, but we
33. don't have the same environment.
34. Because, I'm looking at you, I'm seeing that window
35. behind you, you're not seeing that window behind you.

Why is the statement of F, "I am seeing that window behind you, you're not seeing that window behind you," a support of the preceding claim, C, "You and I are very close in this room right now, but we don't have the same environment." Something has been left unsaid; that something is the generic principle, P, "IF two people have the same environment THEN these two people will see the same things." Without inferring some such principle, there is no way to understand how F supports C.

Furthermore, the connective links between C, F, and P, have also been left unsaid. Some further process must be invoked to yield C from F and P. In fact, two additional processes are necessary: (1) instantiation; and (2) the

application of some logic rule like "Modus-Ponens" (e.g., $A \rightarrow B$, A , Then B) or "Modus-Tollens" (e.g., $A \rightarrow B$, $\text{Not}(B)$, Then $\text{Not}(A)$).

Using such constructs, we can model a listener's process of recognizing a fact F as a support of a claim C , by positing that s/he hears C and F ; that s/he infers an $A \rightarrow B$ principle, such that C is an instance of B (or $\text{Not}(A)$) under mappings M , F is an instance of A (or $\text{Not}(B)$) under mappings M' ; and that s/he invokes some general rule of inference to derive C given F .

The grammar makes use of the "modality" of an assertion in order to choose what general rule of inference is appropriate in a given discourse environment. For example, to prove that a given state of affairs is true (i.e., to prove C), Modus-Ponens is appropriate, whereas to prove that a given state of affairs is not true (i.e., to prove $\text{Not}(C)$) Modus-Tollens is clearly more appropriate.

Using the above form of analysis, yields the following breakdown of Lines 32 - 35 (under the abbreviations, C (Claim), F (Fact of support), P (principle of support), M (Mappings between P and C), M' (Mappings between P and F), and LR (Logic Rule)).

$C = \text{Not}(\text{Our being very close in this room right now Implies that we have the same environment.})$

$F = \text{I am seeing the window behind you. You can not see that window.}$

$P = \text{If two people have the same environment Then these two people will see the same things.}$

$M = ((\text{two people}, D \text{ and } R))$

$M' = ((\text{These two people}, D \text{ and } R), (\text{things}, \text{window}))$

$LR = \text{Modus-Tollendo-Tollens}$

Modus-Tollendo-Tollens is often used to prove a claim C which is a denial of an implication, i.e., $C = \text{Not}(A \rightarrow B)$. To prove an implication of this form, one must show that it is possible for A to be True while B is false. In this case, the conversant shows that B is false via Modus-Tollens, by positing that $B \rightarrow D$, and showing that D is not true.

On Lines 32 - 33, D claims that he and R being in the same room does not

imply that they have the same environment. His evidence for their not having the same environment relies upon the general principle that if two people do have the same environment then they must at minimum have the same things available to them to see. (Whether this principle is in fact valid or not is a separate issue at this point. What is important here is to identify that principle which the speaker seems to believe is true and upon which he seems to be basing his support.) D shows that this is not true of his situation with R, since, for example, he can see the window behind R though R can not see this window. Having shown that even given A (i.e., that he and R are in the same room) B is not true (i.e., they don't have the same environment because they can't see the same things), D has proven his claim that A does not imply B.

4.1.2 So: Restatement of point being supported

A restatement of a claim being supported often occurs after intervening support of the issue context space containing this claim. Such restatements are usually introduced by the clue word "So." In Excerpt 1, for example, R begins resumption of her claim that the aggressive nature of a child is not influenced by his environment, with the clue word "So" ("So you couldn't blame it on the child's home"). This resumption occurs after R supports this claim by showing that two kids sharing the same home environment manifested radically different social behaviors.

4.1.3 Incidentally/By the way: Interruption

Often in the midst of the discussion of a specific topic of discourse, a conversant will be reminded of a related but tangential subject matter. Rather than waiting for the close of the initial topic, conversants often signal its temporary suspension with such clue words as "By the way," "Incidentally," or "Oh, I forgot to tell you." They then immediately begin

discussion of the tangentially related topic of discourse¹⁴.

4.1.4 Anyway/In any case: Return

Corresponding to the clue words for interruptions, we have clue words "Anyway" and "In any case" that indicate when a return to the interrupted context space is about to take place¹⁵.

The following excerpt, taken from a conversation between friends, exemplifies such context space digression and subsequent resumption¹⁶.

Excerpt 4

- A: 1. I remember what happened in January. I went home and I,
2. um, was with my cousin. He's my age, I've mentioned him
3. before. We were in his apartment and um we were talking.
4. I just casually asked how my mother was doing, 'cause I
5. hadn't, you know, I wasn't involved. I didn't know what
6. was happening. And he goes, "Oh, I think she's depressed."
7. This is before she changed - She had this whole fiasco with
8. a job. She never liked her position in her job, which was
9. a big part of her stupid problem, that she never changed it.
10. Oh, I didn't tell you, when I was home a couple of -
11. about two months ago, I was really angry 'cause I know how
12. much she's suffered 'cause she hasn't had a career, or feelings
13. of inferiority. And, here I'm doing it and she's trying to
14. stop me. And so, you know, I get so angry, and she was sitting
15. and talking how important it is to have a career and to be able
16. to do what you're doing. And I was just sitting in the living
17. room dying, really getting angry. But I didn't say anything,

¹⁴Sometimes in fact the new topic is not even tangentially related to the old, but rather is prompted by some external event such as a phone ringing, etc.

¹⁵Recall that such a return is an "expected" conversational move.

¹⁶Cf., [112] for a more detailed analysis of this excerpt.

18. which I thought was progress, that I didn't say anything.

B: 19. Is it?

A: 20. Oh, it was progress, 'cause I used to get into stupid arguments
21. and fights with them.

B: 22. But isn't it hard work to keep all that in?

A: 23. But it was better. Because I would get into arguments with them,
24. and it wouldn't help. What would I do? Just scream or say, "How
25. could you say you want" - I would have gotten into an argument.

B: 26. There might be something between an argument and saying nothing.

A: 27. Yeah, but that wasn't

B: 28. Not to feel like you're bursting your gut.

A: 29: Yeah. That wasn't even that bad, that was just a thing.
30: But anyway, I went home in January and he told me that she
31. was upset.

Lines 1 - 9: Context Space C1, The Interrupted Space.

Lines 10 - 29: Context Space C2, The Digression Space.

Lines 30 - 31: Context Space C1, The Return.

4.1.5 Yes/Right but: Indirect Challenge

The clue words "Yes/Right, but" are used by conversants in the midst of a debate. They signify that while the speaker (i.e., antagonist) is not going to directly attack the argument just put forward by the previous speaker (i.e., protagonist), s/he is going to challenge it by an indirect form of attack. Such, indirect forms of challenges usually entail the specification of a claim, which if true implies that the opponent's claim can not be true.

In the genetic-environmental debate of Excerpt 1, for example, R claimed that a child's aggressive behavior is not much influenced by his environment. This claim is an indirect challenge of D's preceding claim that, in general,

an individual's aggressive behavior is not genetically determined. While R's statements do not directly deny D's preceding claim, if one believes in the nature-nurture controversy, either genetics or the environment is to blame for aggressive/criminal behavior. If R's claim is true (i.e., that the environment is not to blame), then D's preceding claim that genetics is not to blame must be false.

In a later segment of this same excerpt, R once again uses these clue words as a means of indirectly attacking her opponent D, "Right, but, the two brothers have the same environment." Once again, there is no direct denial of D's preceding statements, "It has nothing to do with the child's home. It has to do with the child's environment." However, if R's statements are accepted, then, she has destroyed D's preceding challenge of her (i.e., R's) claim.

4.1.6 (No) But: Direct Challenge

As for "Yes, but," the clue words "No, but," or "But" alone, often signal that the utterances about to be made should be viewed as a challenge of an opponent's preceding utterances. In this case, however, the challenge will be a "direct" rather than "indirect" challenge: for example, complete denial of the truth of the opponent's preceding claim; a rejection of the importance of this claim to the current point of debate; or introduction of an overlooked factor in the opponent's argument.

4.1.7 All right/Okay but: Subargument Concession

"All right/Okay, but," is used in the midst of argumentation by a conversant who while accepting the validity of an opponent's preceding statements, chooses not to end the debate, but rather, chooses to continue argumentation on another point in the debate not yet conceded.

This conversational move differs from the Indirect-Challenge move (which is signalled by a "Yes, but") in that in the "Yes, but" case, the speaker's

move does not entail any concession. That is, though in an indirect challenge, the speaker does not directly deny the validity of an opponent's argument, if the current speaker's succeeding claims are accepted, the opponent's argument, by default, is dismissed.

In contrast, the "All right, but" move, does entail actual acceptance by the speaker of an opponent's preceding argument. And, in this case, acceptance of the speaker's succeeding arguments will not invalidate the opponent's preceding one. In fact, the speaker's succeeding arguments¹⁷ are not addressed to the last point made by the opponent at all. Rather, the new argument being put forward, is in relation to a preceding claim made by the opponent which led to the subargument that the speaker has just conceded.

4.1.8 Support-Challenges

The above three sections delineated three methods of challenge available to a conversant in a debate. Exemplification of all was presented via illustration of a conversant challenging an opponent's preceding claim. In fact, however, these types of challenge moves are not limited to attack of a claim, but rather, include one's challenging (either directly or indirectly) anyone of a claim's supports. In this section, I'd like to briefly focus on this additional means of attack.

In argumentation, a conversant can attack an opponent's claim either by attacking the claim or by attacking any supports given to this claim; a challenge of a claim's supports constitutes a challenge of the claim itself. There are many different means by which a support of a claim may be challenged. To mention but a few: one can respond to an opponent's support of a claim with an "Emotive-Flat-Rejection" (i.e., a "So what" type of

¹⁷These succeeding arguments, in turn, can either be direct or indirect forms of attack.

response) implying that one cannot see the relevance between the supportive statements and the claim purportedly being supported by them; one can deny the truth of the "factual" statements given in support of a claim; one can challenge the truth of the principle upon which the support is based; or one can claim that the domain specified in the support is inappropriately matched to the domain of the claim (e.g., if an opponent's support of a claim that adults should be made to pay for their crimes, rests upon showing that a child's aggressive behavior is not environmentally induced, one can challenge this claim by arguing that one can not compare environmental affects on children with those on adults).

I will now illustrate that the grammar's formal analysis of Supportive-utterances enables it to identify and characterize an opponent's challenge of utterances filling the support discourse role. To this end, let's consider M's challenge (listed below) of R's support of the fact that the environment does not shape a person's behavior. (Recall, R's support was based on demonstrating that two twins living in the same home exhibited radically different social interactive behaviors at an early age.)

- M: 41. And, I mean, they don't even - You know, to say that
42. two kids come from the same family is really meaningless,
43. because when you think of the difference in treatment
44. that two kids can get in exactly the same family, it's
45. incredible. You 'know, it's the difference between night
46. and day.

Since, supportive statements rest on there being some generally accepted generic support principle¹⁸ and a possible set of mappings between the claim being stated, this generic principle, and the statements of support, challenging either the validity of the principle or the mappings set up, constitutes a challenge of the support itself.

In the case above, M challenges the applicability of R's generic

¹⁸Similar in vein to Toulmin's notion of a "backing" [134].

principle to the particular case at hand, i.e., formally speaking, she is challenging R's mapping of "two people sharing the same environment" onto "two twins living in a same home." The challenge is based on the fact that certain presuppositions underlying this generic principle which are necessary to make it valid (and which are true of elements in the generic domain), do not seem to be true of corresponding elements in the instantiated domain. The challenge, then, does not directly deny the truth of the principle, or the truth of the utterances said, but rather, challenges R's current attempt at its application.

In particular, R seems to be using the following support principle in her argument:

IF (A) one's behavior is influenced by one's environment (before & during kindergarten)
THEN (B) two people sharing this same environment will manifest the same social interactive behavior.

Notice that (B) itself is actually an "If Then" statement and that therefore the principle being used can be put into an " $A \rightarrow (D \rightarrow E)$ " form. R wants to show that A is not True (we know this as her statements were said as a means of fixing up her earlier support of the claim, "The aggressive nature of the child is not really that much influenced by his environment," cf., Excerpt 1, Chapter 1); she can do this by showing $\text{Not}(D \rightarrow E)$, i.e., $\text{Not}(\text{If two people share the same environment then they will manifest the same social interactive behavior})$. As discussed earlier, to prove a claim of the form $\text{Not}(D \rightarrow E)$, it suffices to show that D and $\text{Not}(E)$ are simultaneously true¹⁹. R in her support statements does this by instantiation.

To challenge a proof of $\text{Not}(D \rightarrow E)$ which rests upon both D being true

¹⁹The grammar distinguishes between this case and the preceding one called Modus-Tollendo-Tollens, in that in the former case the speaker wants to show $\text{Not}(A \rightarrow B)$ where $B \rightarrow D$. In this case, however, the speaker wants to prove $\text{Not}(A)$ where $A \rightarrow B$, and B is equivalent to $D \rightarrow E$. Though, both forms entail an embedded Modus-Tollens proof, distinguishing between the goals involved, the grammar calls this latter form of argumentation, Modus-Tollendo-Tollens*.

and E false, one can either challenge D's being true, or E's being false. M's challenge, challenges the truth of D in the case being discussed. The challenge, in effect, is "Look, for D to be true (i.e., for two people to be sharing the same environment) it must be the case that at minimum this environment treats the people equivalently. However, in your instance of D this is not true as the two people involved are not necessarily being treated in the same way in this environment which they supposedly share (i. e., their homes). Therefore, since your instance of D may not be true, your having shown that the corresponding instance of E is false, proves nothing."

Notice, that by explicating R's support statements in terms of some generic principle, some logic rule, and mappings established, we can identify that part of R's argument that M is challenging, though, at a superficial level M's statements do not directly deny anything that R has said.

4.1.9 But look/listen/you see: Prior Logical Abstraction~

"But Look/Listen" is used to close a currently active context space and to shift the topic of discourse onto a context space whose topic is "logically prior" to the topic of this preceding context space.

Usually, the preceding context space is of an evaluative nature, i.e., one in which the negative or positive aspects of a given state-of-affairs, S1, is discussed. In the new context space, a state-of-affairs, S2, is discussed, where S2 is believed to be logically prior to S1 in that it provides the environment that enabled S1 to occur in the first place. Shifting onto this logically prior topic of discourse, closes all further discussion of the preceding context space. The following excerpt illustrates this type of conversational move:

Excerpt 5

- J: 1. This happened last, in September of last year. Uh, a
2. guy, another prisoner in death row, he was, uh, he was
3. about to die of - he was to be executed within two days,

4. okay? This is in Alabama, it'sa southern state. And,
5. uh, he would refuse to eat or something like that. Well,
6. I think it was little longer, but, so they force fed him
7. until - up to his execution.

R: 8. Isn't that stupid?

M: 9. That's disgusting.

R: 10. That really makes sense though.

M: 11. But, you see, the whole idea of, of death penalty is
12. completely illogical. Because, you kill somebody for
13. killing somebody, okay?

After M's last conversational move in the excerpt, the subsequent discussion focuses on argumentation between the pros and cons of the death penalty, and leads to the subargument of who is to blame for the occurrence of crimes, i.e., society versus the individual, the environment versus genetics. The question of whether or not it was reasonable or unreasonable for the guards in the prison to force feed the about to be executed prisoner, is totally dropped from the discourse, and instead, the state-of-affairs facilitating this situation in the first place (i.e., there begin such a thing as the death penalty), becomes the new topic of discourse.

A Logically-Prior shift, signifies that continued discussion of the original state-of-affairs is deemed meaningless, and what one has to look at is the state-of-affairs enabling such situations to arise. The shift, then, signals the end of further discussion of this "absurd" situation, and concentration instead on a state-of-affairs enabling its existence²⁰.

²⁰Of course, one could later explicitly attempt to revitalize this earlier discussion. For the case above, for example, one could say, "Well, given that we do have the death penalty, what would be appropriate behavior on the part of a guard confronted with a prisoner starving himself before execution?"

4.1.10 But ... (though): Contrastive Respecification

"But ... though" is similarly used to close a current topic of discourse. In this case, however, the succeeding topic is one previously discussed in the conversation. In general, the point of this preceding topic is one slightly contrastive to the point illustrated by the topic just ended; at minimum, the concepts rebrought-up for discussion overlap those of the preceding topic. As an example of the respecification of a closed context space, after a related topic of discourse is discussed, consider the following excerpt taken from an ongoing naturally occurring conversation²¹.

Excerpt 6

B: We could briefly discuss something, my mother - You see, I don't really want to because I don't really want to sit and talk about her here, you know in a way I'm talking poorly of her, I guess. So, I don't want to sit and talk about her.

(APPROXIMATELY 1/2 HOUR INTERVENING DISCOURSE)

'Cause I feel I'm always telling her things that are good for herself, right? And the same way she thinks she's only telling me things that are good for myself. So, you know, she'll say, "I think I'll go to the country," and I'll try to say, "Oh, good. That's a good idea," and not tell her ten times, "Yeah, why don't you go, why don't you go." I think in a way that's what she does to me, and I don't like it. So, I try not to do it to her.
("SHE" refers to B's mother)

A: But, you said you have some feelings about bringing up this

²¹In the excerpt below, the clue word "but" is not accompanied by the deictic "though." The excerpt therefore illustrates the potential of a clue word's functionality being ambiguous, since, as illustrated earlier, the clue word "but" alone can signal a "direct" form of challenge as well. In terms of a discourse ATN parser, we here have two arcs whose transition tests are identical and both of which are satisfied. Thus, at this point one could in parallel traverse both such arcs.

whole topic of what goes on between you and your mother. You said because it was negative?

On the first line of this excerpt, B is about to tell A something that her mother (i.e., B's mother) did. Before telling the actual episode, however, B skirts around the point, apologizing in a sense for wanting to speak poorly of her mother. After the apology, though, B does relate to A the "negative" episode involving her mother. After discussing the episode, the conversation leads to other points of discussion, one of which is B's feelings that she in turn seems to act negatively to her mother.

Notice that it is precisely at this point that A decides to rebring to the fore of the discussion, B's earlier hesitancy of talking about what goes on between herself and her mother. What makes this respecification interesting or pertinent is not that the two context spaces discuss a common element, (i.e., B's mother), but rather, that in contrast to B's hesitancy in discussing something negative that her mother does in the relationship, when it comes to what B does "wrong" in the relationship, there does not seem to be nearly as much hesitancy on B's part. It is this contrastive aspect of B's behavior that seems to intrigue A, and to cause A to bring up B's earlier hesitancy at precisely this point.

4.1.11 It's like/the same as: Analogy

Analogous context spaces are similar to supportive context spaces in that the development of both are in subordination to a preceding controlling context space. Both derive their meaning from the relation in which they stand to this controlling context space. Though, both entail local shifts of the topic and concepts under discussion, at a more global level, neither shift the topic from the initiating space. In both, throughout discussion of the subordinate spaces, the initiating spaces are of prime importance. Furthermore, just as we conclude a subordinate supportive space with the claim it supports, so too, after an analogous context space is discussed, we usually

resume discussion of the context space which initiated the analogy²².

For example, in the genetic-environmental debate of Excerpt 1, after D compares the situation of the twins living at home to the situation of his and R's current sharing of a same room, the discussion leads back to the specific case of the two twins, ending any further discussion of the situation between D and R.

An analogy conversational move can serve in fulfillment of a number of different discourse roles. Major rules currently identified are:

1. Means of Explanation
2. Means of Support of a preceding claim
3. Means of Implicit Judgement (i.e., conveying an evaluative opinion on a given state-of-affairs by comparing it to a situation for which opinion, either positive or negative, is assumed generally shared)
4. Topic Shift by Contrast
5. Pre-Generalization

In maxim-abiding discourse, only elements felt to be directly analogous or contrastive to elements in the initiating context space are discussed in the analogous space²³. Analogy construction entails a local shift in topic, and, therefore, in general, after discussion of the analogous space (including its component parts, such as supports-of, challenges-of, etc.), we have immediate resumption of the initiating context space. (When analogies are used for goals 4 and 5 noted above, then, if the analogy is accepted, there need not be a return to the initiating space.)

In Excerpt 1, we had an example of an analogy serving the support role

²²For particulars of the formal analysis of "analogous" utterances, see Section 4.1.13.

²³Of course, this does not preclude explicitly noted digressions.

(i.e., D's analogy of his and R's being in the same room but not having the same environment, being used by D as a means of supporting his claim that though the two twins may be living in the same home this does not entail their having the same environment). Two further examples of analogies found in spontaneous discourse are presented below. The first, Excerpt 7, illustrates an analogy being used as a means of explaining some new concept to a listener, while the second, Excerpt 8, illustrates an analogy being used as a means of pre-generalization.

Excerpt 7, is taken from a conversation between G, a nuclear physicist, and J, a math student. In this discussion, G is explaining to J the workings of a particle accelerator. Under current discussion on Line 1 is the cavity of the accelerator through which protons are sent and accelerated.

Excerpt 7

G: 1. It's just a pure electrostatic field, which, between
2. two points, and the proton accelerates through the
3. electrostatic potential.

J: 4. Okay.

G: 5. Same physical law as if you drop a ball. It
6. accelerates through a gravitational potential.

J: 7. Okay.

G: 8: And the only important point here is that the potential is
9: maintained with this Crock ford Walton unit.

Lines 1 - 3: Context Space C1, The Initiating Space.

Lines 5 - 6: Context Space C2, The Analogous Space.

Lines 8 - 9: Context Space C1, The Resumption.

In the following excerpt, we have a speaker, B, comparing the situation of women in the Western tradition, to that of woman in the Hindu tradition. Notice that B limits his discussion of women in the West to their being bought as objects for money. This is in accord with the noted observation that

development of an analogous context space is constrained by the earlier development of the context space to which it is analogous.

Also notice that in the case being presented here, B does not make the analogy to either support a preceding claim, or to explain a preceding concept. Rather, his analogy seems to be serving the role of "Pre-Generalization," in that if his analogy is accepted, then, B has been able to show that the situation brought up by A about the selling of women in the Hindu tradition, is not unique to this tradition. Once accepted, an appropriate follow-up of his remarks could be the general issue of the "selling of women" or the "inferior status of women" the world-over.

Excerpt 8

- A: 1. I think if you're going to marry someone in the Hindu
2. tradition, you have to - Well, you - They say you give
3. money to the family, to the girl , but in essence, you
4. actually buy her.
- B: 5. It's the same in the Western tradition. You know,
6. you see these greasy fat millionaires going around with
7. film stars, right? They've essentially bought them by
8. their status (?money).
- C: 9. No, but, there, the woman is selling herself. In these
10. societies, the woman isn't selling herself, her parents
11. are selling her.

Lines 1 - 4: Context Space C1, The Initiating Space.

Lines 5 - 8: Context Space C2, The Analogous Space.

Lines 9 - 11: Context Space C3, The Challenge Space.

4.1.12 Now: Further Development

The clue word "now" often signals that a new active context space is about to be developed that will contain elaborative comments on the topic and elements of the preceding active context space. Reflecting this, we often

find the clue word "now" accompanying a discourse utterance such as, "Now, it's a little bit more complicated or elaborate than that."

The following excerpt²⁴ is taken from a conversation between a steam plant expert, M, and a cognitive psychologist, A. In this conversation, M is explaining to A the workings of the steam plant. M's explanation is highly structured, and takes the form of a "breadth-first" presentation. That is, M explains the steam plant process by passing through the system a number of times, each pass through informing A of further complexities in its design. This excerpt, occurs on M's second pass through the system, at a point at which M is still at the stage of giving A only a rough outline of the steam plant process.

Excerpt 9

M: 1. The first thing you have coming out of the steam
2. generator as, it's pushing its steam along, is - you
3. have a main steam stop. Okay. And that's just an
4. emergency valve to shut off the steam, uh so that you
5. can take this whole section, long section of piping, and
6. take all the uh steam out of it. Okay, so you
7. can isolate the valve. You want to isolate as close to the
8. steam generator as you can. And, that's all that valve is
9. there for. There is another valve, that's called the root
10. valve, down here. This is the root valve. And it's
11. just in front of the turbines, okay? And, there are a
12. couple of different turbines, I'm going just going to talk
13. about one of them now.

A: 14. All right.

M: 15. Okay. And there are also a couple of auxiliary loads too
16. that we won't talk about. Oh, I should mention on the turbine,
17. just before the main turbine here, there is also a throttle
18. valve. And I'm just going to indicate it with this little
19. thing here. That usually means a cellinoid valve, all I
20. mean to indicate here is that it's a control valve. Okay.

²⁴While speaking, M draws a pictorial representation of a steam plant. Some of his deictic references in the excerpt refer to elements of this diagram.

21. It controls the amount of steam coming through to the turbine.

A: 22. Okay.

M: 23. Okay? And that goes into the turbine.

A: 24. Now, is that normally set at open, or?

M: 25. It's initially shut and then it's opened up. Uh, these are normally open, the root valve and the main steam stop.

As can be seen, at this point in his explanation, M is only mentioning the component parts of a steam plant system and their respective functions. He is not, however, explaining how these parts perform their functions. In particular, for each valve mentioned (before A's last question), M only specifies the name of a valve, its location, and function.

A's question, however, addresses the issue of how one of these valves performs its function (i.e., questioning the state of configuration enabling the valve to perform its function). Bearing in mind M's "breadth first" teaching strategy, which is based on the filling-in of missing details on later descriptive passes through the system, we can see why A's question does not fit in with this strategy. A's utterance addresses a deeper level of description than the one addressed by M in this part of the conversation; it thus warrants the creation of a new subordinate context space²⁵.

4.1.13 Further notes on Analogy

Identification of those aspects of knowledge considered important in

²⁵The fact that M responds to A's question by citing how all of the three valves operate, justifies the claim that M is treating all three valves equally, and the claim that a valve's configuration addresses an issue separate from its noted functionality (i.e., if A's question was merely at the same level of analysis as M's statements, it could have been taken in the particular and not generalized onto the other valves described).

analogy seems to be of major concern in current investigation of this cognitive task ([10, 17, 38, 39, 40, 63, 79, 92, 102, 131, 140] and others). Gentner's Structure-Mapping theory [38, 39, 40] seems most compatible with the findings of this investigation. Gentner argues that analogies are based on an implicit understanding that "identical operations and relationships hold among non identical things. The relational structure is preserved, but not the objects" [40, p.4]. In illustration, Gentner presents the Rutherford analogy between the solar system and the hydrogen atom, wherein the relation MORE MASSIVE THAN holds between the corresponding elements of the respective domains, but where, for example, the absolute mass of the sun and that of the nucleus are of no relevance to the analogy.

The context space theory's contribution to the structure-mapping approach, I believe, is its ability to characterize the relations that must remain constant between the two domains. The context space theory stresses that identification of these relations is dependent on, and identifiable by, the current relevant discourse context and what the speaker is trying to do (i.e., his/her communicative goal). The theory's claim is that analogy comprehension and construction are not as unwieldy as previously supposed; they do not entail combinatorial measures of comparisons between two domains. It is a focused task, like all of discourse processing.

When conversants reject an analogy they either do so by implicitly or explicitly citing a new relation (previously unconsidered) that does not correspond between the two domains, or by citing a noncorrespondence between aspects of a relation already explicitly mentioned. C's rejection of B's analogy between the selling of women in the Hindu tradition and that of the selling of women in the West (Excerpt 8) is of the later form. Using a straight forward structure-mapping approach, the grammar can, without undue difficulty, model such a rejection. However, to model generation of those cases wherein a totally new relation is cited, the grammar needs some further criteria in order to identify a particular noncorresponding relation that is viable for attack. In discussion below, one such possible mechanism of identification is given.

In November 1978, after the mass suicide at Jonestown, there were some media attempts to legitimatize the incident by comparing it to the mass suicide at Masada many centuries ago. Two conversants discussing the analogy, rejected it (and thereby rejected legitimatization of the Jonestown incident), because, they claimed, the people of Masada were a "threatened people, about to be attacked by a foreign and murderous army," an attribute, they claimed, not true of the people at Jonestown.

Implicit in the conversants' rejection, I believe, is the claim that despite the relation "People taking own lives" (to be referred to as R1) being true in the two domains, there are additional relations, vital to the applicability of the analogy to the goal of its construction, that are not constant between the domains. Specifically, the Jonestown incident is lacking the following relations found in the Masada incident: (1) an "ATTACK" relation, R2, between a foreign group of people and the group of people taking their own lives, and (2) a "CAUSE" relation, R3, such that $R2 \circ R3 \circ R1$.

Now, it is precisely because of $R2 \circ R3 \circ R1$, that the Masada mass suicide is usually legitimatized. Hence, since these relations are not true in Jonestown, it is impossible to map the legitimatization of the one onto the other, i.e., the communicative goal of the analogy has failed, warranting its rejection in this discourse context.

Reflecting the above analysis, the context space theory's treatment of analogy rejection rests on recognizing that for a new relation (or set of relations) to be used as a means of rejecting an analogy, it must be the case that this relation(s) is related in some causative or effective manner to the relation (or set thereof) explicitly mentioned in the analogy construction, and that this relation(s) is (are) vital to the communicative goal served by the analogy.

The grammar's analysis of analogies has three main features:

- o the structure mapping theory
- o relevant context identification

- o communicative goal identification

This can be seen by the following:

Explicating the connection between an utterance purporting to be analogous to another, rests on recognizing that for two propositions to be analogous, it must be the case that they can both be seen as instances of some more general claim, such that the predicates of all three propositions are identical (i.e., relation identity), and the correspondent objects of the two domains involved are both subsets of some larger set specified in this more general claim.

Rejecting an analogy is based on specifying some relation, RI, of one domain, that one implies (or claims) is not true in the other, or is based on specifying some non-identical attribute-value pair from which such a relation, RI, can be inferred. In both cases, RI must itself stand in a CAUSE relation (or some other such relation²⁶) with one of the relations explicitly mentioned in the creation of the analogy (i.e., one being held constant between the two domains, that we can call RC). Furthermore, it must be the case that the communicative goal of the analogy hinges on RI(RC) being true (or not true) in both of the domains.

In the section below, I present a third example of analogy rejection exhibiting the above features of analysis.

4.1.14 Succession of conversational moves

The following excerpt is presented to show how a succession of conversational moves play into each other. The excerpt is taken from a taped

²⁶ Since according to this analysis the prime focal point of the analogy is always the relations (i.e., "actions") being held constant, and a major aspect of an "action" is its cause (reason, intent, or effect of occurrence), a noncorrespondence in one of these relations will usually invalidate the point of the analogy.

conversation between two friends, M and N, wherein M, a British citizen, is trying to explain to N, an American, the history of the current turmoil in Ireland. The following conversational moves are involved in this excerpt (the first and fourth being of the same category):

1. Negative Evaluation Analogy
2. Challenge of Analogy
3. Defense of Analogy
4. (Alternate) Negative Evaluation Analogy
5. Return to the initiating context space of the analogy; with the return being a "Further-Development," signalled by the clue word "now."

Excerpt 10

- M: 1. And, of course, what's made it worse this time is the
2. British army moving in. And, moving in, in the first
3. place, as a police force. It's almost a Vietnam,
4. in a way.
- N: 5. But, all within Northern Ireland?
- M: 6. All within Northern Ireland. Moving in as a police force,
7. being seen by everybody as a police force that was going
8. to favor the Protestants.
- N: 9. It'd rather be like Syria being in Lebanon, right?
- M: 10. I don't know enough about it to know, maybe.
- N: 11. There's - Where, there's a foreign police force in one
12. country. I mean, when you say it's like Vietnam, I
13. can't take Vietnam. Vietnam is North Vietnam and South
14. Vietnam.
- M: 15. No, I meant war. You know, moving in and saying we're
16. a police action and actually fighting a war when you got
17. there.
- N: 18. Oh, well, that's Syria, that's obviously Syria, right?
19. Who are implicitly supporting - not supporting - 'cause

AD-A103 566

BOLT BERANEK AND NEWMAN INC CAMBRIDGE MA

F/G 5/7

PLAIN SPEAKING: A THEORY AND GRAMMAR OF SPONTANEOUS DISCOURSE (U)

N00014-77-C-0371

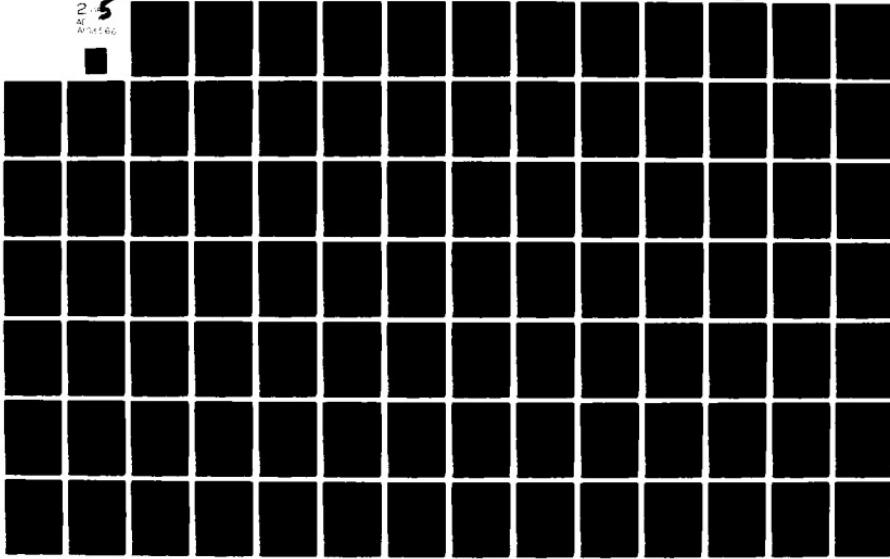
JUN 81 R REICHMAN

NL

UNCLASSIFIED

BBN-4681

2
A
N 124 60



20. actually it's very similar in Lebanon, right? You have
21. the Catholics and the Moslem. That's right, that's
22. Lebanon.

M: 23. I suppose, yes.

N: 24. You have the Catholics and the Moslem, and then Syria's
25. coming in and implicitly supporting the Moslem, because
26. Syria itself is Moslem. Now, England is Protestant?

In the subsequent discussion, particular attention is given to the role and type of rejection given by N to M's analogy; the analogy that N gives in replacement; where the focus of attention lies when these analogies are being given; and how this focus bears weight on where the conversation proceeds after the specification and acceptance of N's replacement analogy.

We can begin the analysis with a more formal characterization of M's analogy conversational move.

The generic proposition underlying M's analogy:

\$Country1 R1 \$Country2 & \$Country1 R2 \$EthnicGroup2

Where, the constant relations are:

R1: MOVE-IN-AS-POLICE-FORCE R2: TAKE-SIDE-OF

The objects mapped onto each other:

Mappings1: England, America
Mappings2: Ireland, Vietnam
Mappings3: Protestants, North Vietnamese

M's communicative goal in generating the analogy:

Negative Evaluation (on England)

In rejection of the analogy, N claims that in the Vietnam case alone the following three relations occur:

R3: FOREIGN INVASION
R4: AID AGAINST FOREIGN INVASION

R5: CAUSE

Where, R5 is a relation between relations, i.e., R3 CAUSE R4²⁷.

The purpose of M's analogy is to highlight her negative assessment of England in the Ireland situation (as identified by her utterance, "And, what's made it worse this time ..."). M attempts to accomplish this by mapping the presumed acknowledged negative assessment of America in Vietnam onto England. Such a negative evaluative mapping, however, can only occur of course if one condemns America's involvement in Vietnam. N denies such a presumed negativity by arguing that it is possible to view America's involvement in Vietnam as coming to the aid of a country against foreign attack²⁸ (i.e., as a positive rather than a negative act).

Thus, argues N, the "cause" relations of the acts being held constant between the two domains (i.e., entrance as a police force but being partisan) are quite different in the two cases. And, in the Vietnam case, the cause of the act obviates any usual negativity associated with such "unfair police treatment." There is no negativity of America to map onto England, and the whole purpose of the analogy has failed. Hence, like in the Jonestown case,

²⁷R4 can be thought of as another way of looking at R1 and R2. Alternatively, it could be thought of as replacing R1 and R2, since when one country invades another, we do not usually consider third party intervention as mere "coming in as a police force and taking the side of," but rather as an entrance into an ongoing war. However, I think in one light one can view the relations of R1 and R2 holding in either an internal or external war.

²⁸Most criticisms of America's involvement in Vietnam rest on viewing it as an act of intervention in the internal affairs of a country against the will of half of its people.

the analogy in this discourse context is vacuous and thus warrants rejection²⁹.

After N's rejection of M's analogy, and N's offering of an alternative analogy³⁰ which is somewhat accepted by M³¹ as predicted by the type of discourse analysis being presented here, it is time to have the initiating subject of this analogy returned-to (i.e., it is time to return to the subject of Britain's moving into Ireland). This is done on Line 26 of the excerpt. Notice, however, that while N does return to this subject, her return is not a "simple" one; as her use of the clue word "now" predicts.

The clue word "now" signals that the context space about to be developed stands in a Further-Development relation to a preceding context space. In the case of Excerpt 10, the further development consists of an attempt to give a deeper level of analysis to the previously mentioned event of the British army entering Ireland and supporting the Protestants. That is, on Line 26, we have a shift from the statement of this event to an analysis of the event in terms

²⁹In a different context, perhaps, i.e., had the analogy been cited for a different purpose, N may have accepted it. In addition, it is important to recognize that though there are numerous other non-correspondences between the American-Vietnam and England-Ireland situations (e.g., the respective geographic distances involved), N's random selection of any one of these other noncorresponding relations (irrespective of their complexity) would not have necessarily led to effective communication or a reason to reject the analogy (similarly, in the Jonestown-Masada case.)

³⁰N's citing of this alternative analogy is supportive of the context space theory's analysis that the purpose of an analogy's creation is vital to its acceptance, since, it happens that N views Syria's intervention in Lebanon quite negatively: thus, her choice of this domain where (in her view) there is plenty of negativity to map.

³¹Notice, by the way, that in terms of "object identity," America is a much closer match to England than is Syria. This example lends further credence to the dismissal of "object-hood" as a major factor used in the creation and interpretation of analogies.

of underlying motivations and the reasons for the participants (specifically, England) behaving as they did.

In general, the preceding context space involved in a Further-Development relation, is the last active context space of the discourse. Now (yes, I'm about to further develop this point), while in the case of Excerpt 10, we are further developing the subject of Britain moving into Ireland, and not the subject of Syria moving into Lebanon (i.e., the preceding active context space), in some sense the further development is still in terms of this preceding active context space. That is, notice that the underlying motivation that N is trying to attribute to England's "invasion" into Ireland and support of the Protestants, is taken directly from the motivation attributed to England's counterpart in the accepted analogy. N's question on Line 26 can be paraphrased by: "Okay, so we accept Syria's presence in Lebanon as a better analogy for England's presence in Ireland. Now, we know, or have just shown that Syria's bias to the Moslems can be explained by the fact that Syria herself is Moslem. It has been stated that England, in a similar situation, is favoring Protestants. Can we then carry motives over as well in the analogy? That is, can we then infer that England is favoring the Protestants because she is Protestant?"

4.2 Formal framework

In preceding sections of this work, it has been shown that: (1) a major part of discourse processing rests upon the identification of a relevant discourse context; (2) relevant discourse identification rests upon identifying the State values of preceding context spaces; and (3) State value of preceding context spaces are determined by subsequent conversational move developments. It seems appropriate then at this point to enumerate these different State values of a context space, and describe how they reflect the level of influence that a so-assigned context space has on subsequent discourse development.

4.2.1 State assignments

Chapter 3's respecification of Grice's maxims states that a relevant discourse context is composed of two context spaces, and further claims that at any given point in time it is in direct relation to these two context spaces that succeeding utterances are interpreted/generated. Now, while I assert that this is the case, one should not infer that all other preceding context spaces do not have any additional role in the continuing discourse. There are varying roles that a context space may play at different points in time, and, while some of these roles temporarily put a context space into the discourse background, this does not mean that the context space will not reappear in the foreground.

In addition, though a context space may be in the background, this is not synonymous with its having no influence on the continuing flow of the conversation. For example, it has been shown that unexpected digressions may occur in a discourse, suspending the instantiation of a particular discourse expectation or completion of a context space under discussion. While the digression temporarily usurps the foreground role, and in the process relegates the interrupted context space to the background, the succeeding conversational development is still constrained and dependent upon the now background context space. For instance, it would be uncooperative to begin a new issue context space after the point of the initial digression context space has been completed. To use Grice's terms, such a conversational move would be "unsuitable at this stage of the discourse." Instead, what is demanded is that one return to, and resume discussion of, the interrupted background context space.

Mirroring the different roles that a context space may play, all context spaces have an associated State slot. The value of this slot denotes the changing influential status of the utterances contained in the context space. The influential status of a context space is used to:

- o determine whether or not this context space will be accessed in our focused processing of succeeding discourse utterances;

- o reflect other levels of influence that this context space may have on succeeding discourse development;
- o determine the type of referring expressions to elements of the utterances contained in this context space that would be both unambiguous and sufficiently informative.

The following seven levels of conversational influence have been distinguished. (On the right, I describe the discourse role of a so-assigned space.)

Active:	The context space in which the utterances currently being stated are placed. There can only be one active context space at a given point in the conversation.
Controlling:	The context space in direct relation to which an active context space is being developed. There can only be one controlling context space at a given point in the conversation.
Controlling*:	A previously controlling context space whose controlling status is temporarily usurped by the creation of a subordinate space to the subordinate space that it was controlling. There may be any number of such "grandmother," "great-grandmother" spaces in the environment. Deciding whether a previous controlling context space gets assigned a controlling* state, depends on its relation to the subordinate space being subordinated-to.
Open:	A previously active context space that was interrupted before completion of its corresponding communicative goal.
Generating:	A context space in indirect relation to which an active context space is being developed. This often occurs in debates, for example, where argumentation of a given claim leads to some subargumentation, the outcome of which can affect the outcome of previous debate on the initiating claim. A context space containing an initiating claim of some subargument has a generating state value while the subargument is argued.
Closed:	A context space, discussion of which is believed completed for the present time (i.e., it is reasonable to believe that its point has been reached).
Superceded:	A context space, discussion of which is concluded by its

being replaced by a new context space whose claim is either a "finer-restatement" or "further-generalization" of its claim. This too most often occurs in debates where an opponent's challenge of one's claim can lead one to giving up on the scope of the claim, but not to give up on the claim in its entirety.

Of these seven, the two most prominent are the controlling and active context spaces; since, as noted earlier, at any given point in a conversation, utterances are interpreted and generated only in direct relation to these two context spaces.³² In addition, as illustrated in Chapter 5, pronominal and close discourse deictic references (e.g., "this X," "the X," "here," etc.) are correspondingly limited to referents in the utterances contained in these two spaces.

In the Grammar section of this chapter, I present some of the grammar's updating actions along its transition arcs corresponding to a given conversational move. These actions change the State assignments of preceding context spaces. Such updating of the discourse model enables adequate reflection of the effects of a given conversational move on a current discourse context.

At this point, let us turn our attention to the different types of context spaces which have been formalized to capture the grammar's analysis of varying categories of conversational moves.

4.2.2 Types of context spaces

Nine types of context spaces have been formalized in this work. The different categorizations mirror the different types of units and phenomena found in a discourse world. For example, corresponding to the fact that the

³²This may, however, entail preceding updating of a discourse environment, as will be illustrated later.

presence of a certain type of discourse constituent is often dependent on the presence of some other independent constituent, distinct spaces have been defined for independent and dependent constituents, such that, spaces corresponding to a dependent constituent fill a slot of a space corresponding to an independent constituent. Additionally, corresponding to the fact that the analysis of some types of conversational moves entail the explication of standardized implicit, unstated components, a context space containing the utterances serving such a move, will have slots to contain such implicit components. Thus, the grammar treats implicit components of a move as much a part of the discourse as those components verbally expressed.

The constituents of the grammar are defined in "Systemic grammar" fashion. The exposition below follows suit; i.e., distinct sets of features are noted at particular levels of the categorization. At each level of further subcategorization, further slot definitions associated with the subcategory are noted. All context spaces at a given level, then, are defined in terms of the slots noted at that level and at levels higher to it in the network.

At the highest level, the notion of a context space is defined in terms of the following slots:

Type: This slot specifies the context space's category name.

Mode: This slot specifies whether the substantive claims within the context space were explicitly stated by the speaker, or whether they were inferred by the grammar. In general, this slot contains "Explicit" as its value; it is only in the case of preceding establishment of a "Deontic" context space (to be explained later) that we usually infer and attribute an implicit "Evaluative" claim to the speaker.

Goal: This slot captures the speaker's communicative goal served by the context space (e.g., Support, Challenge)

Contextual-Function:

This slot is a structured slot consisting of the following two subcomponents:

Method: This slot contains the particular method used to perform the

context space's goal (e.g., Flat-Denial, Modus-Ponens, Emotive-Flat-Rejection)

Co-Relator: This slot contains specific preceding context space in relation to which this method stands.

Speakers: This slot contains a list of persons who have generated the utterances lying in the context space.

State: This slot contains the influential status (i.e., background-foreground role) of a context space at a given point in the discourse (e.g., Active, Controlling)

Focus: This slot is composed of four subslots. Each subslot contains constituents of the utterances contained in the space.

High: This slot notes the constituent in "high" focus.

Medium: This slot contains a list of all constituents in "medium" focus.

Low: This slot contains a list of all constituents "low" focus.

Zero: This slot contains a list of all constituents in the space of "zero" focus (e.g., "associated entities," for example)

There are basically two major types of context spaces composing a discourse world: Issue context spaces and Non-Issue context spaces. In the exposition below, each of these categories will be described and further subcategorized.

4.2.2.1 Issue context spaces

All issue context spaces have the following three additional slots:

Modality: This slot notes the type of claim being asserted in the context space (e.g., Epistemic, Deontic, Evaluative)

Claim: This slot is a structured slot, composed of the following two parts:

State of Affairs:

This slot contains the state-of-affairs being discussed in the issue context space.

"Type" Predicate:

This slot contains the modality in terms of which the state-of-affairs is being discussed.

Topic: This slot specifies the topic being set by the "topic setter" issue context space (usually a generic formulation of the state-of-affairs specified in the space)

SupportCS: This slot contains a list of all the context spaces developed in support of the claim of the issue context space.

All issue context spaces have a "Claim" slot to capture the fact that in an issue context space the truth/necessity, goodness, or appropriateness-questioning, of a particular state-of-affairs is discussed. Mirroring these different types of assertions about a state-of-affairs, a distinction in type has been categorized for these different modalities. The following three types of issue context spaces have been identified:

An Epistemic Issue Context Space: In this type of context space the truth or necessity of a given state-of-affairs is discussed. The "type" of predicate associated with the Claim is an "Epistemic" predicate, whose possible values are: true, not true, necessary, or not necessary.

An Evaluative Issue Context Space: In this type of context space the goodness of a given state-of-affairs is discussed. The type of predicate associated with the Claim is an "Evaluative" predicate, whose value is a pair consisting of a particular evaluative adjective and correspondent positive or negative value. For example, (crazy, negative) is a possible value for this slot. If a speaker negatively evaluates a state-of-affairs under discussion, the grammar usually infers that the speaker is advocating a change in the state-of-affairs, which it notes in an "Advocated-Inference" slot in the context space.

A Deontic Issue Context Space: In this type of context space one questions the "appropriateness" or "fairness" of a state-of-affairs being as it is. The type predicate associated with the Claim is "Deontic" and possible values for this slot are, "Why should" or "Why shouldn't?" Given the

development of a Deontic context space, the grammar usually infers and constructs an Evaluative issue context space in subordination to it. The Evaluative predicate of the inferred space corresponds to the positive or negative form of the deontic claim (i.e., a "Why should X" usually implies that the speaker feels negatively about X, and a "Why shouldn't X," that the speaker feels positively about it).

The last three distinctions between different modality types of issue context spaces does not set up subcategories of this category, but rather, distinguishes between three types at the same level in the network. We can however, further subcategorize anyone of these three types of issue context spaces into Debative or Non-Debative Issue spaces. Non-Debative issue spaces are just ordinary issue context spaces; Debative issue context spaces are a subcategory and they have the following four additional slot definitions:

Protagonists: This slot replaces the usual "Speakers" slot associated with a context space, and it contains a list of conversants advocating the particular type of assertion about the state-of-affairs under discussion.

Antagonists: This slot contains a list of conversants attacking the assertion advocated by the protagonists.

CounterClaims: This slot contains a list of context spaces developed in challenge to the claim contained in this debative issue context space.

CounterSupports:
This slot contains a list of context spaces developed in challenge of the supports of the claim under attack.

There is one more type of issue context space that has not yet been cited. This is an issue context space developed as an analogy to a preceding issue context space. We can have six types of Analogy Issue context spaces corresponding to our three types of modal issue context spaces and corresponding three types of debative modal issue spaces.

For an issue context space to be analogous to a preceding issue context space, it must be the case that the two spaces are of the same modality. That

is, if in the initiating space a state-of-affairs is asserted "true," then in the analogous space an analogous state-of-affairs must be asserted as true as well; similarly for the evaluative and deontic modalities.

As previously noted, the grammar's explication of an analogy conversational move, entails inferring some generic proposition, P, such that, the claim of the initiating context space is an instance of P under mappings M; the claim of the analogous context space is an instance of P under mappings M'; and all three propositions specify the same predication.

Reflecting this type of analysis all analogous context spaces have the following two additional slot definitions:

Abstract: This slot contains the generic proposition, P, of which the initiating and analogous claims are instances. Reflecting the fact that the same predication must be true of both claims, the predicate in the abstract slot is fixed; other elements of the abstract are variables corresponding to the abstracted classes of which the specific elements mentioned in the analogous and initiating claims are members. The structure of this slot, reflecting this importance of relation identity, consists of two subslots:

Relations: This slot contains a list of the relations that are constant and true in the two domains.

Propositions: This slot contains the generic proposition(s) defined in terms of the constant predicate(s) and its (their) variable role fillers.

Mappings: This slot contains a list of mappings between constituents of the generic proposition, P, onto constituents of the analogous and initiating context spaces.

For example, in explication of the analogy between England's moving into Ireland, and the United States' moving into Vietnam, the analogous context space containing the utterance: "It's almost a Vietnam," would have the following form³³:

³³In the notation variable elements are prefaced by '\$'.

Abstract:

Relations: (MOVE-INTO-AS-POLICE-FORCE, TAKE-SIDE-OF)

Propositions: \$Country1 MOVE-INTO \$Country2
&
\$Country1 TAKE-SIDE-OF \$Ethnic2

Mappings: ((\$Country1, Britain, America)
(\$Country2, Northern-Ireland, Vietnam)
(\$Ethnic2, Protestants, North Vietnamese))

4.2.2.2 Non-Issue context spaces

The second category of context spaces, simply called the non-issue context spaces, is made up of three types of spaces: Comment context spaces, Narrative context spaces, and Supportive context spaces.

Narrative & Comment Context Spaces:

Excerpt 5, presented earlier in this chapter and repeated below, contains both a narrative and comment type of context space.

Excerpt 5

J: 1. This happened last - in September of last year. Uh, a
2. guy, another prisoner in death row, he was, uh, he was
3. about to die of - he was to be executed within two days,
4. okay? This is in Alabama, it's a Southern state. And,
5. uh, he would refuse to eat or something like that. Well,
6. I think it was a little longer, but, so they force fed
7. him until - up to his execution.

R: 8. Isn't that stupid?

M: 9. That's disgusting.

J's utterances form an event context space, while R and M's utterances serve as comments on this narrative space.

I distinguish between comment and issue context spaces as a comment space is not a topic setter and does not necessarily introduce a proposition to be evaluated. If a speaker's comment does become the next issue of discussion,

then the comment is put into the claim slot of a new issue space; if the comment does not become a matter of discussion it is appended onto an "OldComments" list in a currently active context space. A comment context space is a temporary subconstituent of an active one.

The following additional slots are specific to narrative spaces.

Orientation Section:

The opening of a narrative usually consists of an introduction to the participants in the narrative and the time and place at which the episode occurred. Corresponding to this the Orientation slot of a narrative space is composed of the following subslots:

- Actors:** This slot contains a list of lists, where each list is composed of two parts: an actor identifier and a list of predication specified about this actor.
- Time:** This slot specifies the occurrence time of the episode and any particulars stated about this time period (e.g., "It was a ghastly period in world history.")
- Location:** This slot specifies the location at which the episode took place, and any predication given on this location (e.g., "It's a Southern state.")
- OEvents:** A list of events that occurred in the episode. The events are usually ordered in linear time and causality.
- HEvents:** A list of contrastive events that could have, but did not, occur in the episode.

Supportive Context Spaces:

There are two major types of supportive context spaces: Narrative-Support spaces and Non-Narrative-Support spaces. Correspondingly, the grammar has separate transition arcs for fulfillment of these two possible forms of a support conversational move: (1) the telling of a story where one event, led up to by preceding told events, is an instance of the claim being supported; or (2) uttering a particular state-of-affairs which, using some generic principle of support and some formal rule of inference, leads one to conclude the claim being supported.

Both forms of support can be accompanied by naming some authority for the information cited. In addition, solely naming an authority for some claim can constitute a support conversational move in itself.

All Supportive context spaces have the following slot definitions in addition to those that they inherent by mere virtue of being a context space:

Support-Fact: This slot either contains some propositional representation of the event of a "Support-Narrative" that is an instance of the claim being supported, or, for Non-Narrative-supports, it contains a propositional representation of the state-of-affairs that implies (by reliance on some generic principle and rule of inference) the validity of the claim being supported.

Mappings: For Non-Narrative-Support context spaces this slot will be filled by the mappings of elements of the generic principle of support onto the support statements, and the mappings of the elements of the principle onto the claim being supported. For Narrative-Support context spaces it will be filled by the mappings of the elements of the claim being supported and its instance of support.

Authority: This is a structured slot consisting of the following four parts:

Source: This slot specifies the person or group that holds the position under discussion

Method: This slot contains the mode in which the source gained access to his/her facts (e.g., "They did this study.")

Credentials: This slot contains the reasons given to believe this source

Access: This slot contains the speaker's specified access to this claim of the source in question (e.g., "I saw it on TV.")

As noted above, analysis of substantive non-narrative supportive utterances entails the explication of many unstated implicit components. In particular, as illustrated earlier, the grammar analyzes such support moves in

terms of an unstated generic proposition³⁴ (usually of the form A -> B), such that, both the statement of support and the claim being supported, taken together, constitute a particular instance of this generic proposition. (Narrative-Support moves, on the other hand, do not seem to rely on an additional generic proposition).

Reflecting this analysis, context spaces containing utterances filling a non narrative support discourse role, have the following additional slot definitions:

Support-Statement:

This slot propositional representation of the actual utterances stated in support. The slot's value will usually be identical either to the slot value of "Support-Fact" or "Principle-of-Support."

Principle-of-Support:

This slot contains the generic principle underlying the support

In exemplification of these slots of a Non-Narrative-Support context space³⁵, consider their fillers for the context space containing R's initial supportive statements (in the genetic-environmental debate) for her claim that a child's aggressive behavior is not environmentally determined.

Support-Fact: A child's social interactive behavior ten years after

³⁴Actually, the grammar's formalization of this move allows for the fact that sometimes a conversant will explicitly state the generic principle underlying the support while leaving the particular state-of-affairs unstated and implicit. For example, it is quite acceptable for a speaker to support a claim that "Alaska is depressing" by saying that "All cold places are depressing," leaving one to infer (or retrieve from knowledge) that "Alaska is a cold place."

³⁵The logical inference rule used, and whose validity may be challenged, is noted in the "Method" slot of the "Contextual-Function" slot of the space.

kindergarten was identical to his social interactive behavior in kindergarten.

Authority:

Source: Study

Method: Investigative filming of kids over time.

Credentials: Excellent French TV documentary

Access: R & J watched on TV

Support-Statement:

A child's interactive behavior ten years after kindergarten was identical to his social interactive behavior in kindergarten.

Principle-of-Support:

IfPart: One's behavior is influenced by one's environment.

ThenPart: One's behavior will change over time.

Mappings:

IfMappings: ((child, one) (aggressive nature, behavior))

ThenMappings: ((child, one) (ten year duration period from kindergarten, over time))

4.3 The Grammar - Updating the discourse model

As claimed earlier, along the grammar's path for different categories of conversational moves, the grammar accordingly reassigns the State assignments of preceding context spaces in its discourse model. In this section, a more explicit description of these updates are presented. In each subsection, particular attention is paid to the reassignment of the State of the context space active immediately before the conversational move is taken. It should be noted, however, that reassignment of this context space usually results in

the reassignment of the State values of a context space which it itself is subordinate-to. In general, this results in these superordinate spaces being reassigned a closed or generating state from an earlier controlling one.³⁶ In later traces of actual discourse, such reassignment are illustrated.

4.3.1 The Support & Further Support moves

A support conversational move can either close a preceding context space or put it in a controlling state. If the preceding active context space is a supportive context space, then the move closes this preceding supportive context space; if the preceding active context space is an issue context space then the move puts this issue context space in a controlling state. These differences reflect the different discourse environments available for a support conversational move.

For example, Fran's brief narrative in Chapter 3, illustrates a support move. In the excerpt, Fran begins by developing an issue context space whose claim is that dreams are very revealing and that she, Fran, has recently acquired insight into them. Fran then signals her shift onto a supportive context space for this preceding issue space with the clue word "like," and begins a narrative wherein she describes a recent situation in which she was able to dissect a girlfriend's dream.

In modeling this piece of discourse, the grammar changes from active to controlling the state of the context space containing F's generic claim about dreams before it generates the subsequent substantive support statements. This reflects that the forthcoming utterances are said in subordination to this preceding context space and is interpreted in relation to it.

In the genetic-environmental debate of Excerpt 1, after D challenges R's

³⁶It is only in special cases that this superordinate space is assigned a controlling^{*} state. An example of such a case is discussed in Chapter 5.

supportive context space of R's preceding claim that a child's aggressive nature is not influenced by his home environment (which was based on the fact that one child's behavior over time did not change), R's succeeding conversational move is to accept D's challenge and to offer an alternative support for her initial claim. Before stating this alternative support, R signals that her succeeding utterances should be seen as fulfilling such a discourse role by saying the explicit shift words "Now another thing," "Oh, and it was twins. The important thing was ..." (R's new supportive context space consists of the fact that two children sharing the same environment exhibited radically different behavior.) Corresponding to the discourse model effects of providing alternative support for a claim, the grammar closes the initial supportive context space; puts the replacement support statements into a new active supportive context space; and the issue context space, containing the initial claim being supported, remains in a controlling state³⁷.

4.3.2 The Restatement move

As noted earlier, a restatement of the claim of an issue context space occurs after supportive evidence is given to the claim. Thus, right before such a conclusion statement is stated, the issue context space being resumed is in a controlling state, and the preceding active context space is the last supportive context space developed in relation to this issue context space. The choosing of this conversational move reinstates this controlling context space as the active context space and closes the previously active supportive context space.

In the genetic-environmental debate, for example, R's utterance, "So you couldn't blame it on the child's home," follows her preceding supportive

³⁷Notice that to allow for such further-support moves, we have to keep the support context spaces distinct from the claims they support.

context space containing her statement of support that two kids sharing the same home environment manifested radically different social behaviors. In modeling this piece of discourse, "So," is taken to signal (1) the close of this preceding supportive context space, and (2) the reinstatiation of the issue context space that it supports as active.

4.3.3 The Interruption move

Suspending discussion of a context space before completion, results in an assignment of open to the State slot of the interrupted context space. A context space's State slot having such a value reflects that it is expected that the speaker will return and complete discussion of this interrupted context space after the digression has been discussed.

4.3.4 The Return move

The Return conversational occurs in the context of a preceding Interruption move. It is signalled by such clue words as "but anyway," "in any case," and the like, which signal the close of the digression context space, and the reinstatiation of the open context space as the active context space in the discourse context.

4.3.5 The Indirect Challenge move

Since the purpose of the set of utterances constituting an indirect challenge are in direct conflict with the purpose of the set of utterances contained in the preceding active context space (i.e., the context space containing the claims about to be challenged), it is clear that they should be placed in a different context space. The invocation of this move, therefore, results in the creation of a new active context space in which these

succeeding discourse utterances are placed. The state of the preceding active context space is reassigned a value of controlling, denoting that the claims about to be put forward are being said in direct relation (i.e., here argumentation) to the claims contained in this preceding active context space.

4.3.6 The Direct Challenge move

The updating of the discourse environment, here, is identical with that performed in the indirect challenge case. Namely, the preceding active context space which is about to be challenged is put in a controlling state, and a new active context space is created to contain the challenge about to be given.

4.3.7 The Subargument-Concession move

As discussed earlier, while the Subargument-Concession and Indirect Challenge moves both have similar clue word signals, "All right, but" and "Yes, but," respectively, they are substantially different in argument form and resulting restructuring of the discourse model.

Thus, while a "Yes, but" move causes the current active context space, containing the opponent's preceding argument, to be put in a controlling state (reflecting the fact that the argument about to be put forward is still in some way a challenge of this preceding argument), the "All right, but" case, causes this active context space to be assigned a closed state value. The closing of this context space reflects that having been accepted, the claims contained within it are no longer open to attack.

In place of this context space, a preceding issue context space, currently in a generating state, is reassigned as the controlling context space of the discourse environment. This reflects that the challenge about to be put forward, and that will form the new active context space, is being developed in argumentation of, and hence subordination to, this preceding

context space. In Chapter 7 of the thesis, a full discussion of this type of conversational move is presented.

4.3.8 The Logical Abstraction Move

As noted in the exposition of the Logical-Abstraction move, this move results in the dropping of one topic of discourse for another. Reflecting this dropping of a topic, the preceding active context space is closed, and a new active context space is developed in which to place the succeeding utterances dealing with the new topic of discussion.

4.3.9 The Contrastive Respecification move

As noted earlier, in the Contrastive-Respecification move, a current topic of discourse is closed, and an earlier discussed topic is rebrought-up for discussion. In this case, then, the active context space is reassigned a closed state assignment, and a currently closed context space in the discourse model is reassigned a value of active.

4.3.10 The Analogy move

Reflecting the fact that an analogous context space is said in subordination-to a preceding issue context space, when the grammar processes an Analogy conversational move, it reassigns the State slot of the preceding active context space (i.e., the initiating space of the analogy) a controlling state, and it puts the analogous comments into a new subordinate active context space.

Upon expected resumption of the initiating context space, the grammar closes the analogous context space and reassigns the initiating context space an active State value.

4.3.11 The Further-Development move

Correspondingly, since a Further-Development move entails finer discussion of an element of a superordinate space, the superordinate space is given a controlling state assignment during discussion of the subordinate elaborative space.

4.4 Cognitive modeling

In preceding sections of this chapter, great attention was paid to the grammar's formal analysis of Analogy, Support, and Challenge conversational moves. I believe, therefore, that it is appropriate at this point to compare and contrast the context space theory's analyses to some recent cognitive work in these areas.

4.4.1 Analogies in spontaneous discourse

In a recent publication, Lakoff & Johnson [79] present a large set of metaphors that people use daily. Their many beautiful and phenomenologically insightful examples range from our natural equation and description of "love" in terms of "war" (e.g., "She fought for him," "He fled her advances," "He is slowly gaining ground with her," "She is besieged by suitors") to "ideas" are "fashions" (e.g., "That idea went out of style years ago," "Marxism is currently fashionable in Western Europe," "Old fashioned notions have no place in today's society").

Many aspects of Lakoff & Johnson's analysis of how and why these metaphors proliferate our daily lives are exceedingly compatible with the approach taken here. In particular, Lakoff & Johnson's focus on a "gestalt" approach to the use of metaphor, and notions of a metaphor simultaneously "highlighting" and "hiding" aspects of an object under discussion and thought,

are in accord with the analysis given above. That is, if we assume that "gestalt" refers to a "wholistic view of relations within a given domain," then the two approaches correspond, since as has been illustrated earlier, Gentner's structure-mapping approach, used in the context space analysis, stresses the importance of a "schematization of relations" holding between the two domains under discussion. Correspondingly, the "highlighting-hiding" phenomena underlying the use of analogies has been stressed in this work, when, for example, it has been claimed that the acceptance or validity of an analogy is context dependent. So, for example, in the context of the conversation in which it was used, the analogy between "England" and "Syria" is valid, in that their respective situations of being an "invading side-favoring police force" is the "highlighted" feature validating the analogy. On the other hand, the analogy in this discourse context hides many of the differing features between these two domains, such as their vastly different social and cultural organizational behaviors.

In accord with psychological theories, it is the contention here that a study of individuals' treatment of analogies, and language in general, can lead to fruitful insight into the mechanisms of cognitive thought. In particular, analyzing analogies found in spontaneous discourse, and rejections thereof, give clear reflections of some of our structural representations of knowledge, our notions of "similarity" and "contrast," our ability to selectively focus on, and thereby "highlight" and "hide," particular pieces of knowledge structures at given points in time, and ability to integrate new knowledge into pre-existing structures.

An analysis of conversants spontaneously discussing analogies is revealing of the dualistic nature of this cognitive task. On the one hand, in some sense, it can be described as a "non-creative," "retrieval-matching" task, while on the other hand, it can be described as highly "creative" and "innovative."

On the ordinary side, we have the fact that the creation of an analogy is restricted and highly predetermined by already existing knowledge structures. That is, contrary to some currently held beliefs, similarities do exist

independent of metaphor, and it is precisely based upon such pre-existing knowledge structures that we create and evaluate analogies. For example, let's consider N's initial response to M's analogy between "Syria's being in Lebanon," and "England's being in Ireland" in Excerpt 10, "I don't know enough about it to know, maybe." This response reflects that evaluation of an analogy necessitates some independent knowledge of the two domains involved. Or, for example, reconsidering M's earlier rejection of the "Ireland - Vietnam" analogy, "I mean, when you say it's like Vietnam, I can't take Vietnam. Vietnam is North Vietnam and South Vietnam," it is clear that M bases her rejection on pre-existing independently established knowledge structures of the two domains involved.

On the other hand, it is simultaneously true, that given some basic structures for comparison, "metaphors can create new meanings for us" and in some cases can "induce similarities" [79]. Exemplifying this later facet of analogies, we see M, in this same excerpt, trying to induce a new connection between the relations she has set up in her knowledge structure of the "England - Ireland" situation (i.e., England's motivation for behaving as she did), based upon, and induced by, her earlier comparison of this situation to that of "Syria and Lebanon."

Thus, analogy is both an "immediately creative" process, while, simultaneously, it is perhaps a "mere retrieval and matching process of already known information."

A second aspect of the creativity process involved in discussion of analogies is, of course, a conversant's insight into the aptness and relevance of an analogy to a particular point of discussion. This aspect of analogy use brings to the fore the whole question of "truth" in analogy, and the question of whether there is some fixed set of relations that must be true between two domains for an analogy between the two to be appropriate.

I would claim that, in general, there is no such fixed set of relations that must hold true between the two domains. That is, the aptness of an analogy, as it occurs in discourse, is not judged by assessing the number of relations that correspond and that do not correspond between the two domains.

Similarity and contrast do not exist in a vacuum. Rather, like there is no set of fixed most important events to be retold each time a particular narrative is said, so too in the case of analogies there is no set number of fixed relations that must correspond. In particular, as illustrated earlier, only those relations standing in a somewhat causative nature to the relation claimed to hold in the initiating context space and which are critical for the purpose for which the analogy is being made must hold true in the analogous context space. Thus, it is context rather than existential truth that creates analogies in discourse.

As noted earlier, analogy comprehension and construction are not unwieldy procedures, and they do not entail combinatorial measures of comparisons between two domains. They are focused tasks, like all of discourse processing.

4.4.2 Formal logic and spontaneous discourse

This section will focus on the relation between the logician's formal logic systems and individuals' rules of inference as exemplified by their spontaneous generation of supports and challenges of claims put forward.

Two works of particular interest to this discussion are that of Johnson-Laird [70] and Toulmin [134]. Both of these works discuss the relevance and aptness of formal logic systems to "the mental processes that underlie ordinary reasoning and the question of what rules of inference they embody" [70, p.73]. As Toulmin states, there is a tension between formal logic as a formal mathematical science and formal logic as a study of "proper, rational, normal thinking processes."

Both these works, in essence, provide a negative prognosis on the applicability of formal reasoning to everyday reasoning tasks. To quote Johnson-Laird, "The development of formal logic has not helped psychologists to elucidate the mental processes that underlie inference" [70, p.76] and Toulmin, "It begins to look as though formal logic has indeed lost touch with

its application" [134, p.9]. My own analysis of spontaneous discourse, however, does not coincide with such negative rejection.

Johnson-Laird's rejection of "syllogistic inference rules" rests upon their nonpredictivity of the specific conclusions generated, or lack thereof, by individuals given two propositions in an experimental environment. His replacement theory "contains no rules of inference. Its logical component consists solely in a procedure for testing mental models," where, a mental model is the development of a consistent and "all combination possible" instantiated "micro-world" of the assertions stated in the propositions. Toulmin's rejection, on the other hand, stems from his assertion that proofs in formal logic systems necessitate "analytic backing," something which we clearly never have sufficient evidence for in ordinary reasoning tasks.

While the truth of these claims cannot be denied, I believe that it is still fruitful and important to recognize that major aspects of formal logic are still quite applicable, and used, in ordinary reasoning tasks; in particular, in the types of informal argumentation found in ordinary discourse. As illustrated earlier, an explication of how a statement of fact supports or challenges a preceding claim often appeals to some generic principle and logical rule of inference. That is, people do seem to use the set of formalized syllogistic inference rules in their establishment of arguments, as strongly reflected by the fact that one's argument can be invalidated not only by an opponent's denial of the truth of one's statement of support, but in addition, by an opponent's denying the validity of the inference rule used to yield the conclusion given a principle of support and support statement.

Secondly, if we recognize that a formal logic system does not run ad-infinitum in isolation, and that it can be amended by, or at least sensitive to, probabilistic criteria and elements in focus, then, I believe, this lack of correspondence between the predictions of formalized logic and what we find in actual experimentation and practice can be reduced. For example, as warranted in discourse argumentation, and modelled in this grammar, conversants use general rules of inference to establish conclusions evident to

both speakers and listeners. That is, a speaker knows the claims s/he wants to prove and a listener (i.e., opponent) too is able to predict that the conclusion the current speaker is aiming at is one that challenges her or his own preceding claim or supports of such.

Indeed, if one looks at the two classic cases of nonpredictivity supplied by Johnson-Laird, one will notice that in both cases the valid conclusion not reached by the individuals tested was a conclusion about an element that only appeared in a predicate position of a premise. For example, his studies show that people, in general, do not conclude "Some of the scientists are parents," given the two premises, "Some of the parents are drivers," and "All of the drivers are scientists." Now, it is well known that a subject of a propositional utterance is usually of higher focus than any of its other elements. As expected, therefore, a system defined in terms of drawing conclusions on elements in focus has difficulty in proving things about entities that are not of primary importance.

5. SURFACE LINGUISTIC PHENOMENA

In Chapter 1, I claimed that the discourse model formulated in this work could account for, and explain, many surface linguistic phenomena found in conversational speech. For example, during the discussion of Grice's maxims, it was specifically claimed that the model would detail the consequences of an element's being in the "foci" of a discourse context, and could specify the effects of a given discourse environment on the type of referring expression that would be considered both unambiguous and sufficiently, but not unduly, informative. In this chapter, these claims will be substantiated.

5.1 Referring expressions

In the last chapter, certain surface linguistic phenomena found in conversational speech were presented; notably, it was shown that much of the dynamics of discourse were enabled by speakers linguistically marking, with connectives called clue words, context space boundary points and the types of conversational moves about to be made. Among the noted correspondences between clue words and conversational moves were pairs such as "But" - Respecification; "Incidentally" - Interruption; "In any case" - Return; "Like" - Support; "Now" - Further-Development, etc.

Maxim-abiding rules of reference can be formulated using the conventionalized effects of a conversational move (and associated clue word) on the status of a relevant discourse context. In particular, the claim here is that it is the relevant discourse context at a given point in the conversation, as determined by the succession of conversational moves taken, that governs whether a pronominal, nonpronominal, or "close" or "far" deictic referring expression is warranted.

5.1.1 Traditional theories of reference

If one begins a study of conversational speech with "traditional" theories of reference in mind, one is amazed to find that many of the predictions of such theories are not found in spontaneous discourse. For example, traditionally, it has been supposed that an element can be referenced pronominally as long as the last reference to the element is not "too long in the past," and as long as interveningly there has been no mention of competing discourse elements for this pronominal reference. However, one of the first things to markedly stand out in an analysis of extended discourse, is that there seem to be many more cases of nonpronominalization than could be accounted for by these criteria.

Intrigued by this noncorrespondence between the predictions of traditional theories of anaphora and what one really sees in spontaneous discourse, I began an independent investigation of discourse reference (cf., [112]). It soon became apparent, that indeed, criteria of recency and semantic ambiguity are not major criteria governing anaphora in natural discourse, but rather, that there is a set of other criteria, particular to the structural nature of discourse itself, that are.

In the following, I demonstrate that the lack of predictive power of these traditional theories of pronominalization results from their ignoring the integral relation between reference and a discourse structure. It will be shown that there are a set of discourse reference rules that are intricately intertwined with the structural nature of a discourse and the mechanisms used by conversants to facilitate smooth and easy conversational flow.

Indeed, the phenomena are so bound with our subconscious processing mechanisms for discourse, that, in my opinion, investigation of such phenomena, in the absence of studying extended spontaneously generated discourse, is a hopeless endeavor. Utterances in violation of these rules are not immediately visibly "ungrammatical" like the '*' sentences of sentential linguistics. In many of the cases where a pronominal form is prohibited by the rules, a speaker's use of a pronominal in any case, probably would not

cause listeners undue difficulty in correctly retrieving the referent intended. On the other hand, their implicit understanding of the discourse structure, which they need in order to adequately model the discourse flow, would probably be confused. The analysis given in this work reflects the way people do speak in spontaneous discourse. It evidences numerous "unexpected" discourse phenomena; phenomena which I believe warrant explanation.

A speaker's choice of referring expression involves much more than choosing an expression that will enable listener identification of the referent involved. A major claim of this work is that what mode of reference is unambiguous, sufficiently clear, and maxim-abiding, is mainly dependent on a current relevant discourse context, and that an analysis of discourse as a mere linear sequence of utterances (such as those which traditional theories must be resting upon), can never adequately predict or explain the surface linguistic phenomena found in conversational speech. There seem to be three equally important aspects to maxim-abiding reference: (1) the listener must be able to determine the referent of the referring expression, (2) this identification process should come "easily", and (3) the listener must be able to integrate discussion of a given referent into the overall structure being developed in the discourse.

Some researchers, most of whose theories are based on an analysis of extended spontaneous discourse, have recognized the important role of nonpronominal and far deictic reference to discourse development. These include Grimes, Chafe, Kuno, and Karmiloff-Smith. Below, I present brief overviews of their statements on reference, and show how an integration of their positions complements the type of analysis being proposed here.

In quite an enlightening article, Grimes discusses how in many languages other than English, speakers use different modes of reference to convey an element's overall role in a discourse [47]. He shows, for example, that in the Bacairi language of Brazil, some pronouns are only (mainly) used for a discourse element that is important to the overall global thematic topic of the discourse. Other pronominal forms are used for elements which are only important vis-à-vis a small section of a local discourse topic. In this same

language, deictic reference is also governed by the thematic structure of the discourse, and, for example, if a minor character of a story is a boy who is close-by and a major character of the story is a woman who is physically far away, after initial introduction of these characters, a close deictic referring expression will be used for the woman while a far deictic will be used for the boy. This is similar to Longrace&Levinsohn's findings about deictics in the Inga language, and noun particle and affixes in the Cubeo language [88] (see Chapter 10).

Chafe uses the notions of "foregrounding" and "consciousness" to elucidate constraints on pronominalization in discourse [18, 19]. Chafe claims, for example, that the terms "new" and "old" information, are better thought of as "conscious" versus "nonconscious" information. That is, "Given (or old) information is that knowledge which the speaker assumes to be in the consciousness of the addressee at the time of the utterance. So-called new information is what the speaker assumes he is introducing into the addressee's consciousness by what he says" [19, p.31]. Then, Chafe says, "As for pronominalization, it can be applied only to items that convey given information" (p. 31).

Kuno also stresses pragmatic constraints on discourse pronominalization [74, 76]. Kuno's constraints are highly integrated with the notions of "empathy" and "topic." Empathy is similar in style to focus, though not identical with it. The context space theory's notion of focus is based on the structural thematic development of the preceding discourse. Kuno's notion of empathy is more interconnected to a speaker's psychological identification with a character under discussion. His "topic" rules, however, are more discourse-context directed. For example, Kuno presents the following example of topic-(non)pronominalization [76, p.286]:

- (17) I have three children: John, Jane and Mary. John is not terribly bright, but among John, Jane and Mary, he is the brightest.
- (18) I have three children: Jane, John, and Mary. Jane is clearly the brightest.
*Between John and Mary, he is the brighter.

Explaining why (17) is acceptable while (18) is not, Kuno states that "While the first part of (17) establishes John as the discourse topic, that of (18) does not" (p. 286).

Karmiloff-Smith, studying the developmental aspects of discourse, had children spontaneously generate narratives from a set of pictures [73]. Her experiments conclusively show that a major aspect of child language development is children's acquisition of sensitivity to "intra-linguistic cohesion." Karmiloff-Smith has evidenced that a major aspect of this developmental growth is children learning to limit their use of a pronominal form to refer to only the main character in a story, i.e., "for the thematic subject of the narrative which the child is now treating as a whole."

Chafe's notion of consciousness, I believe, can be mapped onto my own notion of an element being in "high focus" and Grimes', Kuno's, and Karmiloff-Smith's notion of "thematic subject (topic)." Both of these later terms address themselves to a notion of focus of attention. That is, in the comprehension process of a story, for example, it is the story's central character (i.e., thematic subject) whose actions, motivations, and desires, we usually follow, and it is this character of the story, then, who is in our focus of attention. A natural interpretation for an element being in one's consciousness, presumably, is for it to be in one's focus of attention.

In corroboration of such a pragmatically oriented analysis of discourse reference, I would now like to turn to an article written some years ago by Hankamer & Sag [55], wherein they distinguish between "deep" and "surface" anaphors. "Deep anaphora," the authors tell us, allows for "pragmatic control and has other properties indicating that the anaphoric relation is determined at an essentially presyntactic level" (p. 392), and it is "sensitive to the coherence of semantic units that are not directly represented in the superficial syntactic structure"³⁸ (p. 419). An example of a deep anaphora occurs in the following scenario: Mark and Tim are studying a portrait in an art museum and Mark exclaims, "It's stupendous."

³⁸Emphasis my own

The type of "pragmatic control" allowing for these deep anaphors, I believe, is the common theme of "attention focus" running through the above cited works. In fact, using these works, we can take "deep anaphora" control even further than Hankamer & Sag did. That is, it seems warranted to claim that pragmatics not only governs "unexpected" deep anaphora pronominalization, but more importantly, dictates nonpronominalization to many syntactically "legal" anaphors. Thus, while pragmatic control, in a vacuum, may allow a speaker to reference many different sorts of elements pronominally, for smooth, maxim-abiding, effective, communication, only corresponding elements in a listener's focus of attention (as determined by the discourse structure) should be so referenced.

While the correspondences noted above exist between the works cited, the works do not put forth identical claims, nor do they all address the same issues. In particular, Hankamar & Sag's notion of "pragmatic control," Kuno's notion of "empathy," and Chafe's notion of "consciousness," are not limited to elements from a relevant discourse context. "Thematic subject" and "high focus entity" identification are so limited (i.e., these later terms do not address themselves to elements external to the discourse). Additionally, this works' focus is on extended discourses and resulting dynamic changes of a current relevant discourse context over time. Many of the nonpronominalization examples to be presented in this chapter result from context space shifts. Grimes', Kuno's, and Karmiloff-Smith's work concern themselves mainly with phenomena within what can be called a single context space.

In discourse processing our thinking is highly concentrated, focused, and in terms of a single point of reference. That section of the discourse which is currently relevant, in our consciousness, and used as a point of reference for subsequent interpretation and generation, lies in the controlling and active context spaces of our discourse model. Depending on previous thematic development of the discourse (i.e., sequence of conversational moves processed), different sections of the discourse will be active or controlling. Pronominalization and nonpronominalization are, then, dictated by the discourse structure.

In the sections to follow, numerous examples are presented to illustrate that though perhaps not as dramatic as in the languages illustrated by Grimes, we do in English make analogous distinctions in reference type based on an element's thematic structural relation to the overall discourse. (In particular, analogous to the Bacairi and other languages cited by Grimes, even in English we use close versus far deictic expressions based on the thematic subject flow of the discourse, and we reserve pronominalization, in the main, for "globally" topical elements.)

5.2 Context space theory of reference

In an analysis of spontaneous discourse, one finds that in contrast to traditional theories of reference, the major criteria governing discourse anaphoric reference are:

1. The current and preceding State assignments of the context space in which the anaphoric referent lies.
2. Particular discourse expectations that we have about the future discourse role of a context space.
3. The anaphoric referent's focus level within a context space.
4. The other potential referents in the current relevant discourse context.
5. The discourse role being played by the utterance in which this anaphoric reference is contained.

The above criteria are each interwoven with one another. For example, the State value of a context space often reflects what, if any, particular expectations we have on the context spaces's future role in the discourse. Moreover, the discourse role played by an utterance is derivative from the conversational move it performs, which, in turn (as shown in Chapter 4), dictates context space updating of state assignments. In the sections below, a further explication and exemplification of these criteria will be presented.

5.2.1 State value of the referent's context space

As delineated in Chapter 4, there are seven possible state assignments that a context space may have at any given point in the conversation. These state values are:

1. Active
2. Controlling
3. Controlling*
4. Open
5. Generating
6. Superceded
7. Closed

For most purposes, state values of Closed and Superceded are equivalent. They both signify that their respective context spaces play no role in the current discourse development and that there is no expectation that they will do so in the near future.

A Generating context space, on the other hand, while not directly related to current discourse development, is indirectly related to it: (1) the resolution of the current discussion usually affects one's opinion of the claims or events described in this generating context space; and (2) it is expected that at some future point in time there may be a resumption of this generating context space.

An Open context space, similarly plays an indirect role in the current discourse development. As noted earlier, there being an open context space in the discourse environment, constrains future development of the discourse, in that it is expected that there will be a "speedy" return to a discussion of the subject of this interrupted context space, and that new topics of discourse will not interveningly be established.

Correspondingly, a Controlling* context space plays an indirect (but

important) role in discourse development. Its role is comparable in many ways to that of an open context space; particularly in the strength of expectation of one's returning to the space. While, as noted above, there is usually some expectation of returning to a generating space (especially from subargumentation), in essence, such returns are optional. Not returning to an open or controlling* context space, on the other hand, involves violation of maxim-abiding rules of discourse³⁹.

The Controlling context space, plays a most major role in the current discourse development, since as noted earlier, succeeding discourse utterances are generated and interpreted directly in terms of the utterances contained in the controlling context space. In fact, reflecting this important role, all but one of the discourse grammar relational rules responsible for generating "substantive" discourse utterances (cf., Chapter 11), are written in terms of high-level thematic relationships between the utterances contained in this context space and the context space currently being developed.

Comparably, the active context space is in the foreground of discourse development, as it is in this context space that utterances currently being generated are placed.

As can be seen, a context space's State assignment, reflects its level of prominence and relevance to current discourse development.

In terms of a conversant's choice of referring expression, these State assignment distinctions are of great relevance. For example, one aspect of pragmatic control of reference is limitation of a pronominal form to refer to

³⁹Open and controlling* context spaces are differentiated from one another basically because of their differing conceptual origins and accompanying clue word resumption indicators. An open context space results from digressive interruption; a controlling* space results from further subordinations.

a discourse element in high focus in one's current consciousness⁴⁰. As noted earlier, that portion of the discourse in current consciousness is contained in the current active and controlling context spaces.

Olson notes that "words designate, signal, or specify an intended referent relative to the set of alternatives from which it must differentiated" [101, p.264]. Identification of such a set of alternatives is highly interrelated with a discourse structure and current relevant context identification. Thus, for example, using the rule of pronominal reference cited above, before using a pronominal form, one must just ensure that there are no other high focus elements in the active and controlling context spaces contending for this pronominal form.

The grammar facilitates identification of Olson's set of alternatives⁴¹ by (A) formulating rules like the above; (B) constantly updating the States of individual context spaces (based on the known effects of interveningly processed conversational moves); and (C) correspondingly, updating focus level assignments of individual elements within these spaces.

The grammar's reference rules are quite simple:

- R1. Only elements in high focus in a currently active or controlling context space may be referenced pronominally.
 - R2. Only elements in a currently active or controlling context space may be referenced by a close deictic referring expression.
-

⁴⁰This rule must be qualified to allow for occurrences of intra-sentential syntactically governed pronominal references (which includes reference across sentences connected by a conjunct like "and," cf., [73]). In addition, the rule should allow for pronominalization in an utterance functioning as an identifying relative clause for an entity of a preceding utterances (e.g., "This was in Alabama. It's a southern state").

⁴¹As discussed in Chapter 10, Vendler's notion of "associated entities" [136], and Webber's notion/mechanism for "evoked entities" [137] have yet to be integrated into the grammar.

- R3. Full definite descriptions are needed to reference elements in a closed context space.
- R4. Only far deictic or full descriptive referring expressions can be used to refer to elements of a generating context space.

I have already presented the grammar's State assignment updating rules (cf., Chapter 4) and will therefore now concentrate on the third element of the grammar's procedure for identifying Olson's set of alternatives (i.e., its process of focus level assignment).

5.2.2 Focus level assignments

There are three aspects to the grammar's process of focus level assignment:

1. initial focus level assignment to an element of an active context space;
2. possible shifts in focus level assignments during the time the space is in an active state;
3. possible shifts in focus level assignments when the space is removed from an active state.

In the sections below, each of these processes are discussed.

5.2.2.1 Focus level assignments during activation

If we look at natural language, we see four major means of referring to an object under discussion: (1) Pronominally, (2) By Name, (3) By Description, (4) By Implicit Reference. It is my belief that corresponding to these four means of reference, there are four possible levels of focus for a given

entity⁴². The following summarizes and exemplifies the correspondences:

<u>Mode</u>	<u>Focus Level</u>	<u>Example</u>
Pronominal	High	Your having called him up.
Name	Medium	Your having called Mark up.
Description	Low	Your having called your son up.
Implicit	Zero	Your having called.

At first glance it may seem surprising to the reader that the grammar assigns a zero focus assignment to an entity referenced elliptically, since, up until this point there seems to be a constant inverse relationship between the amount of description given in a reference and the referent's assigned focus level. The noncorrespondence here, however, only serves to emphasize the grammar's distinction between an element's "focus-interest level" and its "givenness." Clearly, to maxim-abidingly reference something elliptically, necessitates that this element be "known," and in "consciousness." However, it does not necessitate its being of importance to current discussion. If it were important, it would have been mentioned.

The linguistic support for the grammar's zero focus assignment to elliptical elements, is that one finds that in continuing discussion, when one of the conversant's does reference the elliptical item, they do so by name or description, and not with a pronominal form. If the elliptically referenced element were brought into high focus by mere virtue of such a reference, then,

⁴²Other than focus level criteria, there are of course some other causes of choosing one mode of reference over another. For example, it is clearly the case that we usually refer to individuals by name (rather than description) to a listener who is quite familiar with the person under discussion, even if, for example, our story does not center around this individual. Implicit reference occurs when, for example, in back reference to a preceding cited event, we only reference some of its components. It also is meant to include such invoked entities as "the engine" of a car when a car is mentioned [136].

a conversant would immediately pronominalize her/his next reference to this element. They do not do so however⁴³.

The grammar uses the correspondences noted above to decide what type of referring expression to use in reference to a constituent of a given context space. In the context space approach, a mode of reference to an entity does not establish its focus level, but rather, given a certain focus level, a certain type of referring expression is used. Thus, for example, according to maxim-abiding reference rules, an individual cannot simply cause an entity to be in high focus by referring pronominally to the entity. Rather, first, the entity must be established in high focus, and then the element can be referenced pronominally.

The following criteria establish a constituent's focus level assignment in an active context space. (The rules are both syntactic and thematic in nature.)

- F1. A constituent appearing in the subject position of an utterance is assigned a high focus level assignment.
- F2. A constituent appearing in subject position of a there-insertion clause is assigned a high focus level assignment.
- F3. A constituent appearing in a pseudo-cleft, cleft, or topicalized clause is assigned a high focus assignment.
- F4. A constituent referenced by name after previous references by description is re-assigned a high focus assignment.
- F5. A constituent specified as the agent of an event is assigned a high focus assignment.

⁴³It should be mentioned, that the spontaneously generated elliptical examples upon which this analysis is based, were of the form wherein the utterance containing the elliptical reference entailed a return to a previously suspended context space. In essence, the topic of the resumption of the closed space was a somewhat more generalized version of the initial topic of the closed space. These cases then are not the usual cases of ellipses discussed in the literature, wherein a preceding utterance suffices for the elliptical expansion.

- F6. A constituent specified as an "experiencer" of some event is assigned a high focus assignment.
- F7. Initial focus level assignments to entities in a digression context space, that were previously mentioned in the interrupted context space, are those which these entities had in the interrupted context space. Rules of assignment for other constituents are the same as those for any other first mentioned constituent.
- F8. Initial focus level assignments to entities in a supportive/challenge context space, that were previously mentioned in the issue context space being supported/challenged, are those which the entities had in the initiating space. Rules of assignment for others are those like for any other first mentioned constituent.
- F9. Constituents of an analogous context space are assigned the same focus level assignments as their correspondents in the initiating space.
- F10. An entity referenced by name is assigned a medium focus level assignment.
- F11. An entity referenced by description (e.g., "her boy friend") is assigned a low focus level assignment.
- F12. Time and locative constituents are usually initially assigned a low focus level assignment, unless otherwise warranted by a rule given above.
- F13. If an entity's high focus level assignment is usurped by another constituent (i.e., by the other constituent warranting a high focus level assignment due to one of the rules noted above), then, the old high focus constituent is reassigned to a medium focus level.
- F14. A constituent removed from high focus, by F13, must have its high focus status explicitly re-instantiated by some focus level rule given above.

These rules specify an item's focus level assignment during the time that the space in which it is contained is active. When a discussion of a context space is suspended, depending on the type of suspension involved, a constituent's focus assignment may automatically be changed. The context space theory's rules for focus change when an accompanying shift in context space occurs, is presented in Section 5.3.2.2 of this chapter.

The following excerpts, taken from spontaneous discourse, illustrate the efficacy of identifying rules R1 - R4 and F1 - F14 as a means of modeling and predicting certain contextually dependent surface linguistic referring expressions.

Excerpt 11:

- M: 1. And, so steam goes into the turbine. And, it goes in as
2. very high pressure steam, comes out as very low pressure
3. steam, okay? And it goes into a thing called the condenser.
4. The condenser's job is to convert the steam into
5. water, okay? And, it's actually at a vacuum.

The major interesting aspect of this excerpt in terms of surface linguistic phenomena is M's utterance on Line 4, where, M not only does not reference the condenser pronominally, but in addition, he unpronominalizes his earlier pronominal references to the steam. Why does he do this? Certainly one of the two, if not both, could have been referenced pronominally without any resulting semantic ambiguities.

Using the rules cited above explains these seeming surprising occurrences of nonpronominalization. By syntactic criteria, we know that the steam is in high focus on lines 1 - 3 (i.e., it is subject of all these utterances). From semantic criteria we know this as well since the steam is the "agent" of the "events" described here⁴⁴. In terms of the structural organization of the dialogue (which is a piece by piece description of, and focus-on, the parts of the steam plant in linear order, with the turbine and steam part coming before the condenser), this is true as well.

On Line 4, however, M is ready to turn his attention to the next part of the system (i.e., to the condenser). Using the context space pronominalization rule that only elements in high focus may be pronominalized (and that there is only one filler per space for such a slot), M cannot immediately pronominalize his next reference to the condenser, since the steam, and not the condenser, is currently in high focus. However, the effects of the condenser being in subject position on Line 4, are to simultaneously assign it a high focus level assignment and to re-assign the

⁴⁴It has been brought to my attention by L. Polanyi that M's descriptive explanation in this dialogue can be thought of as a pseudo-narrative.

steam a medium focus level assignment (F1 and F13 above). Thus the steam is not pronominalizable on Line 4, and by Line 5, the condenser is (as reflected by M's subsequent pronominal reference to it).

As a second excerpt illustrating the rules cited above, consider the following piece of discourse taken from a conversation between friends. Sue, the speaker, has just recently broken up with her ex-boy friend, Albert, and on preceding turns of the talk she has described all aspects of the breakup (in all glory detail). At this point in the conversation, however, Sue turns the discussion away from the breakup to a discussion of her own general state of mind (resulting from her emotional makeup, the recent breakup, and other breakups in her life).

Excerpt 12:

- S: 1. I put everything, my feeling, in a total intellectual
2. basis. I said that - It's funny 'cause, by the way,
3. when I was thinking about Albert, I was thinking about
4. how I would think about Albert, years from now. You
5. know look back upon it and what context Albert would
6. fit in my life.
7. And my gut phrase was, and I said, "And I decided that
8. history will really be kind to Albert."

Once again we see instances of nonpronominalization that cannot be explained by ordinary measures of recency and potential semantic ambiguity; namely, S's repetitive nonpronominalizations to Albert. I should note that in contrast to this section of talk, in preceding sections, when Sue was describing the events of the breakup, she consistently used the pronominal "he" to refer to Albert. The only viable explanation I have of this striking contrast is reliance on the focus level (F1 - F14) and reference rules (R1 - R4) cited above.

S's references to Albert occur in two context spaces; a digression context space (Lines 3 - 6), and a support context space (Lines 7 - 8). According to the focus level rules for digression and support context spaces, only elements previously in high focus in the initial context space being

interrupted or supported receive automatic high focus levels in the digression and supportive spaces. Where no such carry-over elements exist, focus level assignments are as per all first mentioned constituents (F7 and F8 above).

Albert, does not appear in S's issue context space of Line 1. He also does not appear on Lines 2 - 7 as subject of an utterance or of a there-insertion, and he is not mentioned in a pseudo-cleft, cleft, or topicalized clause. Nor is Albert mentioned as an agent or experiencer of an event. Then, according to the grammar's focus-level assignment rules given above, Albert is not in high focus; he is not considered a thematic subject of discourse. (As discussed above, it is S and her own emotional state that is.) Hence, the predicted nonpronominalizations to Albert in these utterances.

The following excerpts demonstrate the effects of a shift in focus within development an active context space. In particular, these excerpts exemplify rules F13 and F14 noted above, wherein it is claimed that once a constituent A's high focus status is usurped by another constituent, B, constituent A must have its high focus status re-established before it again becomes available for a pronominalized reference (even if immediate re-pronominalization would not introduce any semantic and syntactic ambiguities).

Excerpt 13:

- P: 1. What happened, her boy friend from Holland ["Her" refers
2. to a woman named Tammy] - they just left today as a
3. matter of fact, but we've been spending the past couple
4. of days together, no just evenings at home - and somehow
5. they got into this discussion about Americans. And they
6. were still doing it. And this - his name is Tom - and
7. he said something, "Oh yeah, Americans are so open. The
8. minute they meet you they tell you their whole life
9. history." And I was getting very upset because despite
10. everyone saying that - and even her own - Tammy's own -
11. saying, "Oh, who said that was right," or "I wouldn't
12. tell anyone what to do," they were sitting and categorizing
13. people.

Let me commence analysis of this excerpt by pointing to P's sudden specification of the name of Tammy's boy friend. Why does she do this? Using

F11, we know that Tammy's boyfriend is in low focus on Line 1. Now, on Line 6, P seems about to cite an event whose agent of action is Tammy's boyfriend. Using F5, this would put Tammy's boyfriend in high focus. However, P was going to refer to him as "This guy," a descriptor, which using F11 would imply that the boyfriend is remaining in low focus. First specifying the boyfriend's name, and then citing the event he was involved in, though, allows for non-conflicting signal sending (i.e., by stating Tom's name, P establishes Tom's high focus level status, F4). Then, in citing the event, P can now pronominalize her reference to him (which she does on Line 7 of the excerpt).

Now, what about P's subsequent self-corrected initial pronominal reference to Tammy on Line 10 of the excerpt? It is clear that the only possible referent for this pronominal in this excerpt is Tammy. Why does P self-correct herself? The answer, I believe, once again can be explained by the reference and focus level assignment rules cited above. Using F13, Tammy is currently in a medium focus status (i.e., Tom, the boyfriend, has usurped the high focus role). Thus, P's initial re-pronominalization to Tammy violates the focus pronominalization constraint that only high focus elements may be pronominalized (i.e., R1); hence, the self-correction.

As a second example of nonpronominalization resulting from an intervening shift in focus, consider the following excerpt taken from spontaneous discourse.

Excerpt 14:

- G: 1. So I said, "Let me tell you about my chess game." And
2. he goes, "You don't do what I want you to do, so I'm
3. not interested in anything you do." ["He" refers to G's
4. father] And so I said, "Oh," and we just hung up the
5. phone, you know. And then my mother called me back and
6. I didn't tell her I was angry. I didn't say anything,
7. but I guess she knew. She said, "Why'd you hang up?"
8. And I said, "I thought we had said our good nights."
9. Because, sometimes she gets involved and then she
10. becomes the victim, right? And I didn't want to have
11. that happen.

- B: 12. This was between the two of you.

G: 13. Between me and my father, and I didn't want her to get
14. involved.

G initially focuses upon her father and a disagreement that they had. Then, on Line 5, she switches her focus and discusses her mother's role in the interchange.⁴⁵ As G's mother is subject and agent of the event being described, generation of this utterance, results in G's mother replacing G's father in the high focus slot of the context space.⁴⁶ B's statements, however, indicate that she has not gone along with G's switch in focus, and that she is continuing to focus on G's father and G's argument with him. (This is strongly reflected in B's speech by her use of "this" to refer to the argument, and her use of a pronominal reference, embedded in the plural personal pronoun "you," to refer to G's father.) Of current interest is G's response to B's statement.

There is no apparent reason for G's explication of B's phrase, "between the two of you." The referents were clear to G, and one's usual purpose for explication, questioning or confirmation, are not applicable here. G's intonation pattern for the phrase, "between me and my father," which was that of a statement and not of a question, and her continued talk without pause for a response from B, support such a conjecture. Why then the explication? Why

⁴⁵In [112], to protect the privacy of the conversants, all participant names and proper names were changed in the excerpts presented. For the same reason, when I there presented this excerpt, I changed mother and father to sister and brother. Unfortunately, however, mother and father turn out to be special cases, which illustrates the danger of assuming even minimal changes can be safely made.

⁴⁶Though, here, we go directly from descriptor to pronoun, this excerpt should not be seen as a counter-example to the rule that, usually, an intervening name specification is required. One rarely refers to parents by name.

the nonpronominal reference to her father?⁴⁷ The answers to both, I believe, lie in the fact that G, unlike B, has shifted her focus of attention. Her father is then not available in her own discourse model for continued pronominalization. Her response strongly signals this shift to B.

As a third example of focus level shifts, consider the following excerpt taken from M's descriptive explanation of the steam plant to A.

Excerpt 15

- M: 1. And the condenser converts the low pressure steam now
2. into water, okay?
- A: 3. It uses sea water to do that?
- M: 4. It uses sea water to do that. It has a pump in the sea
5. water line, okay? It takes, um, water - And there are
6. valves isolating it from the outside and it pumps the
7. stuff around and pushes it over the side.
- A: 8. Now, the sea water does not mix with the steam, is that
9. correct?
- M: 10. No, it does not.
11. Do you want to talk about the internal workings of
12. the condenser?
- A: 13. Whatever you think is important. I just wanted to be
14. clear on that.
- M: 15. Okay. Essentially what it - the condenser has is a

On Lines 11 - 12 of the excerpt, M suspends actual description of the plant system and questions A about subsequent thematic development of the discourse. In the grammar, a separate path was designed to hold such

⁴⁷ It has been brought to my attention that a "Between X & Y," where Y is pronominal, may be awkward. However, as we often do find such constructions in any case, I do not believe that it provides a complete explanation for G's nonpronominalization.

"transitional-utterances" where conversants question, describe, or predict, continued development of the discourse. Such utterances are "meta" statements in that the conversation itself becomes an object of discussion within its own development. Such a shift in level of discussion, probably always results in a temporary suspension or reassignment of focus level assignments. In the case at hand, this assumption is even more to the point since M's proposal that the next topic be the internal workings of the condenser, is not actually confirmed. At the time of M's utterance, therefore, the condenser is not in high focus. Realizing this, M self-corrects his premature pronominal reference to the condenser on Line 15.

5.2.2.2 Context space shifts and focus level reassessments

In preceding discussion of the grammar's updating procedures along its path for a given type of conversational move, it was stated that an important feature of such updating involves reassignment of a preceding context space's State assignment. Of usual accompaniment of such a State change are changes to the focus levels of entities contained in the space. The following are the correspondences between a State change and focus level reassignment:

SH1: Closed/Superceded:

Whenever a context space's state is changed to closed or superceded, all elements contained in its "high," "medium," or "low" focus level slots are taken out of these slots and they are put into the "zero" focus slot.

SH2: Generating:

Whenever a context space is put into a generating state its element of "high" focus is taken out of the high focus slot and is put instead into the "medium" focus slot.

SH3: Open/Controlling*/Controlling/Active

Changing a context space's state to either open, controlling*, controlling, or active, does not result in any changes to its current focus level assignments.

Interrupting and temporarily suspending completion of a context space (i.e., putting it in an open state), figuratively, results in a "freeze

"storage" of the context space until it is resumed. That is, any current focus level assignments to its constituent elements are held constant, and the point of exposition remembered.

Further subordination to a subordinate of a context space (resulting in a controlling* space), similarly, entails temporarily removing from direct attention certain elements of concern. As to be exemplified below, this type of shifting, however, corresponds to a "local" shift in attention and an analogous freeze storage of the initial objects of interest.

Reassignment of a context space to a generating state, on the other hand, entails suspending the space in a somewhat completed state, with only some slight possibility of its being returned to. In this case, therefore, its high focus element, is reassigned a medium focus assignment, and on re-entrance to the state, immediate re-pronominalization is not allowed.

Correspondingly, reassignment of a context space to an either closed or superceded state, entails suspension of the space in a completed state. In these cases, the suspension is total, in that there is no particular reason to expect its resumption. Reflecting this, such shifts result in a removal of all elements from focus, reflected in their reassignment to a zero focus level.

Reinstantiating a context space to controlling or active is like bringing a box back into view, and re-establishing it as a point of reference for subsequent concentration. On first re-encountering the box, we see it as it was last left - i.e., no changes to its focus level assignments.

Using these rules of focus level reassignment that accompanies a change in State assignment, we can then expect, for example, that upon re-entrance to an open context we will have immediate continued pronominalization to an entity pronominalized before the digression, and expect to not have such immediate continued pronominalization on re-entrance to a closed context space. Such predictions are borne out and are in evidence on .. analysis of naturally occurring spontaneous discourses.

As described in much detail, associated with each of the grammar's traversal paths for a given type of conversational move, the grammar has a set

of standardized updating actions that it performs. These actions include creation of discourse expectations, and updating of current state and focus level assignments. In the sections below, a number of excerpts are presented illustrating the efficacy of these updating actions. In particular, the excerpts demonstrate that these actions create the discourse environment needed to model and explain many of the referring expressions found in spontaneous discourse.

5.2.2.3 The Return expectation

Returning to an open context space constitutes a return-pop⁴⁸ in the discourse. Conceptually, a return-pop is like going back in time to the exact situation that we had before the interruption occurred. Modeling this, before the grammar resumes discussion of the open context space, it (1) closes all interveningly established context spaces; (2) reassigned all their focus level values to zero (SH2); (3) resets the States of preceding context spaces back to where they were before the interruption occurred; and (4) resets CCS and HEAD-CCS to the values they had before the digression.

As interrupting a context space does not affect any of its focus level assignments (SH3), constituents left in high focus are immediately reproductivizable. Since, all interveningly mentioned elements are in closed context spaces, all of them have zero focus level assignments (SH1), and, thus, they are not possible contenders for a pronominal reference. Hence, their possible syntactic/semantic fit for the subsequent pronominal may be ignored.

⁴⁸As further described in Chapter 7, there are many different types of discourse pops. Some pops (such as returning to an interrupted context space, resuming an initial subject of discourse after subordinate further-development discussion, or popping in a task oriented dialogue from discussion of a sub-task [49]) allow for immediate reproductivization, other pops (such as giving replacement support for a preceding challenged claim, or returning to a completed subject of discourse) do not.

To illustrate that the grammar's pronominal rules and updating actions along transition paths, can be used as an effective model of informal discussion, consider, for example, A's immediate pronominalization to her cousin after she signals her return to the interrupted context space, "But anyway," I went home in January, and he told me that she was upset," (Chapter 4, Excerpt 4). This pronominal reference, that occurs on Line 30 of the excerpt, refers to a discourse entity who was last mentioned on Line 6. Its occurrence supports the claim that recency is not a governing factor of pronominalization, but rather, that it is the discourse structure and appropriate updating of the relevant discourse context that is.

5.2.2.4 The Resume-Analogy expectation

As noted and exemplified earlier, after an analogy conversational move, we expect the specific subject initiating the analogy to be resumed. Mirroring this, on the grammar's path for processing an analogy conversational move, the grammar sets up the discourse expectation that the context space containing the initiating claim will be resumed after the analogy is completed.

I have also claimed that discussion of an analogous context space represents a "local" shift in topic; that development of the analogous space is constrained by earlier development of the initiating space; and that reflecting this, during development of the analogous context space, the initiating context space is in a controlling state⁴⁹.

Lets now revisit some of the excerpts presented earlier that contained analogy conversational moves, focusing on the type of referring expressions

⁴⁹The "local" versus "global" shift distinction that I am making here, corresponds, I believe, to the type of distinction made by Grimes when he considers a subsection of a narrative that focuses on a minor character to be a local and temporary shift from the global topic that concerns a major character of a story.

speakers use for entities of the initiating space of an analogy, upon its resumption. In discussion below, I illustrate that the grammar can account for the reference types used, and I show how these discourse occurrences support the claim that reference expression is dependent upon the current and preceding State assignments of the context spaces involved, the focus level assignments of their contained constituents, and any discourse expectations interveningly established.

Excerpt 7

- G: 1. It's just a pure electrostatic field, which, between two
2. points, and the proton accelerates through the
3. electrostatic potential.
- J: 4. Okay.
- G: 5. Same physical law as if you drop a ball. It accelerates
6. through a gravitational potential.
- J: 7. Okay.
- G: 8. And the only important point here is that the potential
9. is maintained with this Crock-Ford Walton unit.

Lines 1 - 4: Context Space C1 - The Initiating Context Space

Lines 5 - 7: Context Space C2 - The Analogous Context Space

Lines 8 - 9: Context Space C1 - The Resumption

Excerpt 8

- A: 1. I think if you're going to marry someone in the Hindu
2. tradition, you have to - Well, you - They say you give
3. money to the family, to the girl, but in essence, you
4. actually buy her.
- B: 5. It's the same in the Western tradition. You know, you
6. see these greasy fat millionaires going around with film
7. stars, right? They've essentially bought them by their

8. status (?money).

C: 9. No but, there, the woman is selling herself. In these
10. societies, the woman isn't selling herself, her parents
11. are selling her.

Lines 1 - 4: Context Space C1 - The Initiating Context Space

Lines 5 - 8: Context Space C2 - The Analogous Context Space

Lines 9 - 11: Context Space C3 - The Challenge Context Space

Notice that upon resumption of context space C1 in Excerpt 7, the close deictic "here" is used to refer to C1, though in terms of linear order, context space C2, the analogous context space, is the closer context space. Also notice that G uses a close definite reference "the potential"⁵⁰ to refer to one of C1's elements (last mentioned on Line 3), though interveningly, on Line 6, he had referred to a "gravitational potential."

In Excerpt 8, we have similar occurrences of "surprising" deictic references. In particular, C, on Line 9, uses the far deictic "there" to refer to an element of the linear close analogous context space⁵¹ and contrastingly uses the close deictic "these"⁵² to refer to refer to an element of the linearly far initiating context space.

⁵⁰"That potential" would have been a far definite reference.

⁵¹The conversation was recorded in Switzerland, and in terms of a locative use of deictics, Western society is the closer rather than Hindu society. Thus, the choice of deictic cannot be explained by appeal to external reference criteria.

⁵²Notice, however, that C does not use "here," to refer to the Hindu situation, though, "here" is usually used as a contrastive term to "there." This corresponds to the caveat given in Chapter 8, that a speaker's "physical reference frame" can over rule reference choices that would be appropriate vis-à-vis the "discourse reference frame."

These reference phenomena are a result of an analogous context space's relative lower status in the discourse than that of the space which initiated the analogy.

G's analogy in context space C2, Excerpt 7, is done for purposes of explanation. His resumption on Line 8 of context space C1 is then an expected conversational move. As described earlier, the grammar processes such resumptions by choosing in its start state the corresponding discourse expectation creating when the analogy conversational move was first taken. The grammar's actions along its "Resume-Analogy" path, is to close the analogous context space and re-instantiate as active the initiating space (whose current state is controlling).

Since the grammar's rules for discourse pronominalization and type of deictic and definite reference is determined by a context space's current state and focus level assignments, the close deictic reference to the initiating space and non-modified reference to one of its elements (i.e., to "electrostatic potential"), do not cause any semantic ambiguity. Such close deictic referring expression could not be referring to elements of the closed analogous context space (i.e., R2).

Line 9, Excerpt 8, on the other hand, is a challenge of an analogy used for purposes of Pre-Generalization. On its path for Pre-Generalization analogies, the grammar does not set up a Resume-Analogy expectation. However, as long as the analogy has not yet been accepted, the initiating context space is considered of higher influential status than the analogous space.

As noted earlier, a major purpose of the grammar's updating of the State assignments of preceding context spaces is to provide a single frame of reference for subsequent interpretation and generation. The discourse model's controlling context space usually serves as this reference frame. Now, in processing a type of analogy-challenge, wherein, a comparison of constituents of two context spaces is performed, the grammar must choose either the initiating or analogous space as its reference frame (i.e., as the space to be in a controlling state during the challenge). Reflecting the initiating space's higher influential status, the grammar chooses the initiating space.

Therefore, on the grammar's transition path for this form of analogy-challenge conversational move, the grammar puts the currently active analogous context space into a generating State (reflecting its new background role), and it leaves the initiating space in its controlling state (i.e., it has been serving as the reference frame for the analogy construction). A new active context space is created to hold the forthcoming challenging utterances.

Using R2 and R4, then, it is only appropriate to refer to elements of the initiating space by close deictics (as it is in a controlling state) and to refer to elements of the analogous space by far deictics (as it's in a generating state).

Let's now revisit that portion of the genetic-environmental debate of Excerpt 1 where we had an analogy conversational move.

Excerpt 1

R: 29. Right, but the two brothers have the same environment.

D: 30. They do not have the same environment.

R: 31. Why not?

D: 32. Because, you and I are very close in this room right now
33. but we don't have the same environment.
34. Because, I'm looking at you, I'm seeing that window
35. behind you. You're not seeing that window behind you.
36. You are not looking at you, I am doing it.
37. Two people can't be in exactly the same place at the
38. same time, otherwise, they'd occupy the same space.
39. They do not have the same environment.
40. They don't have the same friends.

M: 41. And, I mean, they don't even - You know, to say that
42. two kids come from the same family is really meaningless,
43. because when you think of the difference in treatment
44. that two kids can get in exactly the same family, it's
45. incredible. You know, It's the difference between night
46. and day.

Why is D's immediate repronominalization of the "two brothers" on Line 39, despite the fact that they were last mentioned on Line 30 and

interveningly the pronominal "they" was used to refer to "two people," a maxim-abiding and effective means of reference? Why does it not lead to a semantic ambiguity?

As explained earlier, Lines 32 - 33 serve as an analogous claim to that of Line 30, and Lines 34 - 36 serve as supportive context spaces to the analogous claim. And, as discussed, citation of an analogous context space (including its subconstituent supports/challenges) do not usurp the foreground role of the initiating space of the analogy. This is reflected by the grammar's creation of the "Resume-Analogy" expectation, and its reassigning the initiating space a controlling* State during subordinate development of the analogous space.

Lines 37 begins the Resume-Analogy move (i.e., this is one possible manner of resumption). It serves as a transition utterance between the analogous and initiating utterances. In particular, it specifies an abstract principle validating the point of analogy. The effects of this move are to close the analogous context space and its supports; reassign the initiating space a controlling state; and begin a new active issue context space. After generation of the abstract principle, the initiating space can either be resumed (in this same move), or possible subordination to the new issue space may follow (on a subsequent move). If this last option is chosen (as it is in the Excerpt above), then, the grammar, before returning to its start state, reassigns the initiating space a controlling* state, and it creates a second "Resume-Analogy" expectation.

After Line 38 of the excerpt, where a support space for the abstract claim is developed, the grammar returns to its start state, wherein, it once again chooses the Resume-Analogy expectation. This time, the abstract principle space and its supportive space are closed, and the initiating space of the analogy is reassigned an active state assignment.

By the time the substantive remarks of Line 39 are generated, then, the initiating space is once again active and all intervening spaces have been closed. Since, during all intervening discussion, the initiating space was always in a controlling or controlling* state, its focus assignments upon the

return, are the same as they were before the analogy (SH3). Therefore, immediate pronominalization is viable, and "the two people" intervening syntactic/semantic contender is not a constraining factor (since, it is currently in a closed context space with a zero focus level assignment).

Now what about M's nonpronominalization to "the two brothers" on Line 41 of the excerpt? Did not D just reference them pronominally? In terms of linear order and potentiality of semantic ambiguity, there seems no reason for this nonpronominalization.

There are a number of different competing factors which may have led to M's initial pronominalization and later self-correction. One of these factors has to do with the fact that M's remarks are not a continuation of the context space developed by D on his preceding turn, but rather, entail a pop-back in the conversation and are said in challenge of an earlier supportive context space developed by R. R's support space that M attacks (i.e., the one with the two twins behaving differently) is currently in a closed state. Hence, M's reference to one of its constituents (two twins) must necessarily be nonpronominal; hence, one factor of her self-correction.

This last example is contrastive with the preceding cited examples of resumption, where, the pop back was to open and controlling* context spaces; states that allow for immediate continued pronominalization.

5.2.2.5 Returning to a Closed Context Space

As a last example of state and focus level assignments governing a speaker's choice of reference, let's reconsider parts of Excerpt 6, Chapter 4, repeated below.

Excerpt 6

B: We could briefly discuss something, my mother - you see, I don't really want to because I don't really want to sit and talk about her here. You know, in a way I'm talking poorly of her, I guess.

(APPROXIMATELY THIRTY MINUTES OF TALK)

B: I think in a way that's what she does to me, and I don't like it. So, I try not to do to her.
("SHE" refers to B's mother)

A: But, you said you have some feelings about bringing up this whole topic of what goes on between you and your mother. You said because it was negative?

Since there are no intervening elements competing for a "she" pronominal, and B's mother was just referenced pronominally in B's last utterance, we must ask ourselves why A felt the need to refer to B's mother nonpronominally in her immediately following utterance. It is my contention that she did so due to thematic structural constraints operative in discourse pronominalization.

A's conversational move in the excerpt is one of Contrastive-Respecification. As noted earlier, this move closes a currently active context space.⁵³ Closing a context space not only zero-outs all of its focus level assignments, but in addition, causes its removal from one's reference frame for subsequent discourse engagement. Subsequent reference resolution is not done in terms of it. Hence, the appearance of A's mother in this space is basically tangential to subsequent reference resolution.

The Contrastive-Respecification move entails re-activation of a previously closed context space (i.e., one other than the one just closed). Since, the context space re-referenced was in a closed state before this re-activation, by the time of A's reference, A's mother, an entity of this space, still has its zeroed-out focus level assignment. Hence, A's nonpronominalization to her.

⁵³I should point out that the clue word "but" often signals such closure. In fact, it is for this reason that we often find it accompanying the clue word "anyway;" "but" is used to stress the close of the digressive active context space, "anyway" is used to signal the re-instantiation of the open one as active.

This example, and the grammar's analysis, highlights the structural nature of discourse reference. Notice that it is the focus level of A's mother in the returned-to space that determines subsequent reference to her. Linearity plays little part in this determination.

5.3 Conclusion

This chapter could be expanded with additional examples supporting the claims already evidenced and further cases of a discourse structure determining a speaker's surface linguistic forms (such as a speaker's use of the deictic "that," and use of the present progressive tense [113]). More to the point of the thesis, however, is further explication of the discourse grammar developed, and I therefore leave such continued discussion for another occasion.

In conclusion of this chapter, it should be indicated that the rules presented here, and the type of discourse tracking performed, offers a single, coherent, and specifiable explanation for all these differing cases of "interesting" surface linguistic phenomena found in spontaneous discourse.

6. THE GRAMMAR: BASIC SCHEMATIZATION

Having presented much of the grammar's structural analysis of discourse, and some description of the grammar's theoretical framework that enables it to characterize such an analysis, we can now discuss in some detail the operation of the grammar on specific pieces of extended discourse.

This chapter's description focuses on the grammar's control structures, data structures, and organizational design. I will illustrate that these elements enable the grammar to model the many context sensitive features of maxim-abiding discourse. Chapter 7 focuses on the grammar's modeling of discourse pops; in particular, its treatment of further supports and challenges of context spaces not under current discussion.

6.1 Control structures

One can either think of the grammar as an ATN network, or if preferred, as a computer program INTERLISP like in style. In ATN jargon we speak of states; in computer jargon, we speak of routines and functions. There is a 1-1 correspondence between the states of the grammar and its functions. Therefore, in the descriptive overview of the grammar given here, the terms state, function and routine are used interchangeably. In the following sections, a brief description of these alternate representations for the grammar is presented.

6.1.1 ATN representation

In Figure 6A, a small portion of the grammar is presented using an ATN

representation⁵⁴. The reader will notice that on most arcs between states there are tests that must be met before the corresponding state transition can be taken. Numbers on arcs correspond to the numbered descriptions given in Figure 6B, where a fuller explanation of the tests and their formal specification in the grammar are cited.

States of the ATN are represented in the diagram by circles. From any state in an ATN grammar, one can either "push" or "go" to another state. If one pushes to another state, then, upon completion of the pushed-to state, control is returned to the point immediately following the push action. If, on the other hand, a go is performed from one state to another, upon completion of the second state, control is either passed on with another go or is returned to the point in the grammar wherein the last push occurred. In Figure 6A, a push is represented by having the state pushed to stated on the arc, with the state in the circle at the end of the arc being the state to which control passes on return from the push.

6.1.2 Program representation

In Figure 6C, this same portion of the grammar is presented. Here, the representation is more like a computer program, and it includes all actions associated with a given state transition, specified in terms of function definitions. The functions are written in a predicate-calculus-like formal language. The language is composed of a number of primitive predicates (some procedural in nature, others logical or semantic), such as PUSH, GO, FOR SOME, NOT, NE (Not Equal), DENY, TRUE, INSTANCE, ENTAIL, AND INFER. All the rules of the grammar are written in terms of such predicates, dummy variables (such as "I"), and the context space structures and registers of the system. Effort

⁵⁴While there are many actions associated with each of the states in the Figure, for clarity, only "push" actions are cited.

was taken in the specification to enhance readability. Infix notation is used for multi-argument predicates, with spaces delimiting the elements (e.g., Expectation APPEND Expectation-List), and should be read as English-like sentences; prefix notation is used for single-argument predicates (e.g., NOT(X)); the selection of a slot of a construct is indicated by 'name of construct' '.' 'name of slot' (e.g., Expectation.Context); and indices are notated by {}'s (e.g., CCS.Counterclaim{I}).

As noted above, there is a 1-1 correspondence between the ATN and program-like representations. For example, the "Go X" and "Push X" statements in Figure 6C correspond to state transitions in Figure 6A (i.e., "X" will appear as a state in the Figure). Equivalently, all "Step" statements in Figure 6C, represent some state of Figure 6A. For example, "Step 2" in the "Challenge-Choice" routine of Figure 6C, corresponds to the "Challenge-Choice/Step 2" state of Figure 6A.

Step statements have been used in the grammar as a means of indicating automatic passing of control between the different parts of a routine. That is, unless otherwise directed, after completion of Step I, control is automatically passed to Step I+1 of the routine. Routines have been broken down into distinct steps as a means of conceptually distinguishing between its different types of actions, and to have its place of return after a push clearly visible.

6.2 Data structures

As explained earlier, as a conversation progresses, the grammar keeps track of preceding conversational development in its discourse model. This model is composed of registers and context space structures. Each time a conversational move is taken, the grammar updates its discourse model.

To model maxim-abiding discourse, where utterances are semantically and organizationally connected to one another, discourse tracking is mandatory. As illustrated, preceding conversational development can constrain and set up

predictions for subsequent development. As each cycle through the grammar corresponds to a single conversational move, within a single cycle through the network, the grammar must record all relevant effects of the move being processed. In this manner, on a subsequent traversal, it can access these noted effects and thereby correctly model the different dependencies between preceding and succeeding discourse utterances. In the section below, I describe a number of the registers⁵⁵ in which the grammar records such effects. (A characterization of context spaces and how their slot values correspond to conversational moves processed has already been presented in Chapter 4.)

6.2.1 The Registers

ATN's use registers as a means of passing values between states, and as a means of blocking inappropriate arc transitions. On any arc between two states, any number of register tests may be made to determine whether the current context warrants or requires such a transition.

In this grammar, extensive use is made of registers for transition testing. Context space and register values are set by conversational moves (i.e., by preceding passes through the system). Hence, testing these constructs on subsequent cycles through the network can forestall conversational development that is inappropriate in light of the preceding development. In later sections of this chapter, pieces of discourse are presented that show how transition of an arc (in performance of a conversational move) in violation of register tests leads to the production of uncooperative and often gibberish discourse. For the moment, however, without

⁵⁵Some registers function much like local variables of an ordinary programming language in that they are not used in transition tests, but rather, are used merely as temporary place holders. These registers, therefore, are not included here, and are not capitalized in the Figures.

reference to any particular pieces of discourse, a brief review is given of the major discourse registers used in the system:

1. **The Expectation Register:** The Expectation register is a structured register that contains the following four parts:
 - a. **Function:** a state in the grammar which corresponds to a conversational move category;
 - b. **Speaker:** the conversational participant expected to carry out this discourse move;
 - c. **Context:** that context space which will most likely be active or controlling during the processing of this conversational move;
 - d. **Associated-Constraints:** specifies the constraints that will have to be met when this expectation is fulfilled.
2. **The Expectation-List Register:** The Expectation-List register contains a list of yet unfulfilled discourse expectations.
3. **The CCS Register:** The CCS register points to the active context space in the current discourse environment, which is the context space under current (or last) discussion.
4. **The HEAD-CCS Register:** The HEAD-CCS points to the controlling context space in the current discourse environment, i.e., to the context space in direct relation to which the active context is being (or was) developed.
5. **The Discourse-Mode Register:** The grammar at present distinguishes between two discourse modes: the discussion mode and the debate mode. The distinction is made because certain moves are more appropriate in one mode rather than in the other.
6. **The Type-Further-Challenge Register:** The Type-Further-Challenge register may take on one of three values: "Challenge," "Support," and "Nil." A "Nil" value designates that the challenge being given is an initial challenge against a preceding context space; a non-nil value indicates that the challenge is a further challenge. Corresponding to the two options available for further challenge, the register can have one of two possible non-nil values: "Support" - the challenge will take the form of giving replacement support for an earlier flawed supportive argument, "Challenge" - the challenge will be a new counterclaim or countersupport.

7. The Speaker Register: The Speaker register denotes the conversant whose conversational move is currently being processed.
8. The Participant-List Register: The Participant-List register contains the names of all the conversants of the discussion except the one currently holding the floor (i.e., except for the conversant named in the Speaker register). It is updated each time a new speaker is chosen.
9. The Sides Register: The Sides register contains lists of the participants on each side of an argument during a debate. The Sides register is continually updated and allows for participants to change sides and play a "devil's advocate" role.
10. The Future-Defender Register: In the midst of a debate, before the grammar reassigned the Speaker register to an antagonist, it records the name of the conversant about to be challenged in the Future-Defender register, so that it can set up the discourse expectation that this challenged conversant will respond with a counter-challenge.
11. The Domain-Constraints Register: This register contains all the points already conceded by conversants within an argument, to ensure that these "flawed" points are not re-used.
12. The * Register: The * register contains the value just returned from a pushed to routine.
13. The Analogous-Space Register: When the validity of an analogy is contested this register contains the identifier of the analogous context space.
14. The Re-Enter Register: This register is used in reassignment of the state of a controlling context space. If it is set, the space is reassigned a controlling* state, else it is reassigned a generating state.

6.3 Flow description - Design criteria

6.3.1 Organizational, constructive, and productive routines

There are three major modes of processing performed in discourse

generation: (1) finer and finer categorization of the type of message to be generated; (2) updating our discourse mental models in preparation for generation of such remarks; and (3) actual production. Correspondingly, the grammar's states (via their associated actions on arcs) are of three types: (1) organizational, wherein tests and decisions are performed in finer categorization of the forthcoming conversational move category; (2) constructive, wherein the updating actions associated with a given move, which include register assignments and the creating and updating of context spaces, are performed; and (3) productive, wherein actions produce the message to be generated (or recognize it in recognition mode).

Organizational routines are high level, traffic directing; constructive and productive routines can be considered low level, or the terminal stations to which traffic is directed: they can only be reached via transition of an organizational state. Organizational states first push to constructive states and only subsequently push to productive ones. In this manner, any necessary updating of the discourse model is performed before a productive state is reached. This is needed, because as described, all productive actions are written in terms of a current relevant discourse context. This context usually must be updated before message formalization.

For example, a speaker's further argumentation after concession of a flawed subargument (as signalled by the speaker's clue words, "All right, but,") usually entails a re-challenge of an opponent's preceding claim which led to the subargument just conceded. Before subsequent generation, then, the grammar must update the relevant discourse context to have it re-established to the context space being popped back to which contains the claim to be re-challenged. First pushing to a constructive state and then to the productive state wherein the message to be generated is formalized, enables such context

updating⁵⁶.

6.3.2 Discourse expectations

Effective modeling of maxim-abiding discourse rests on recognizing that preceding thematic development usually constrains and set up predictions for subsequent development. The grammar records all such predictions in its Expectation-List register. On each subsequent cycle through the transition network, the grammar usually begins in its start state (which is called "Produce-Next-Move"), whose five possible transitions correspond to the grammar's highest level characterization of different categories of conversational moves. One category is performing a predicted conversational move. The grammar can determine (if desired) whether there are any outstanding discourse expectations by checking the Expectation-List register which contains the discourse expectations that have not yet been fulfilled or cancelled due to intervening conversational moves. If there are such outstanding expectations, the grammar can either choose to fulfill one of them, by choosing Choice A in this state, or it can choose to ignore them all by choosing another category of move (i.e., choosing one of Choices B - E in the state instead).

When viewed as a generator, the grammar's choice of one discourse expectation over others is totally random. That is, in its current stage of development, there is no routine to call at this point to choose one expectation over another based on some criteria of recency, severity of expectation, and the like. In addition, the grammar's choosing or not

⁵⁶In recognition mode, of course, the updatings performed along the path to final recognition of the utterances, are tentative until such an end state is reached. Conceptually, one should think of the grammar's paths being tested in parallel until one path (or several) show success, while others fail due to precondition tests encountered along the way.

choosing to follow a discourse expectation is entirely optional. Criteria of prominence and optionality/nonoptionality will be added to the grammar at a later point in its development⁵⁷. When viewed as a parser or simulator of existing dialogues, the grammar's choice of expectation is dictated by the flow of discourse being analyzed.

When a discourse expectation is chosen, the expectation is taken out of the Expectation-List register and put into the Expectation register, and control is passed to the state predicted in the discourse expectation (i.e., the state specified in Expectation.Function). Currently, the grammar sets up discourse expectations for resuming an interrupted context space; returning to the initiating subject of an analogy (when mandated); further-challenging an opponent's claim or support in a debate; and counter-challenging an opponent's challenge.

Discourse expectations carry along with them a lot of information: they cite a conversational move, the speaker expected to execute this conversational move, the conversational context in which this move is to be performed, and a list of associated constraints that the move will have to fulfill. Discourse expectations are one of the major means of tracking the effect of preceding discourse utterances on a conversation's ensuing flow.

Any routine reachable through a discourse expectation is inaccessible by other means. This constraint was placed on the grammar design to better parallel a psychological model of discourse production. The routines accessed through an expectation are all initial paths of conversational moves, and would therefore in any case only be accessible by some other choice in the Produce-Next-Move state, or by an initial choice in the Developmental/Step 1 or Non-Developmental/Step 1 states. If states accessible by a discourse expectation were also specified as explicit choices at these arc transitions,

⁵⁷Expectations involving context spaces whose states are either open or controlling* should be considered nonoptional, expectations involving generating state context spaces, optional.

then, the model would, in essence, simultaneously be choosing and rejecting a course of conversational development under identical conditions. Simultaneous acceptance and rejection does not seem a correct model of human performance.

6.3.3 When to choose next speaker

Contrary to a common conception of a discourse grammar, this grammar does not begin a new conversational move with a choice of the next speaker. The grammar's organizational schema has been constructed in terms of those aspects of the preceding conversation felt to be most constraining on succeeding conversational moves. These aspects, in general, do not usually hinge upon speaker shifts.

For example, in discussion mode, independent of which conversant first introduced a particular issue (i.e., claim) into the discussion, it is equally likely for all conversants to agree with, and support, this claim.

As a result, first paths in the grammar have to do with deciding what type of conversational move can, and will be, executed, rather than focusing on who will perform this move.

In addition, there are some conversational moves where it is felt that a particular conversant is more likely than another to be the executor. For these moves we could not choose a speaker at random without introducing complications into the grammar's design. For example, in debate mode, a speaker will usually counter-challenge an opponent's claim, rather than counter-challenging a claim made by the speaker him/herself or by a member of the same side. The grammar's state responsible for counter-challenges, currently only accessed via execution of a discourse expectation, is the Challenge-Choice/Step 1 state. Let's say that in its start state, the grammar begins by selecting person A as next speaker, and A is known to be on the same side of the argument as the last speaker, person B. For such a case, the grammar would somehow have to restrict its next transition so that it did not view going to the Challenge-Choice/Step 1 state (which would result in A's challenging B's statements) as a likely (or frequent) path to be followed.

Rather than complicating the grammar's design by having to direct its flow of control (i.e., possible transitions) in terms of those expectations that it has for a particular speaker, the grammar delays immediate speaker selection in the start state and uses the discourse expectation register as a means of facilitating such traffic dependencies. For example, whenever a speaker A's claim is challenged by speaker B, the grammar sets up the discourse expectation that A will respond with a counter-challenge to B's challenge. By forestalling the choice of next speaker and beginning instead with the choice of a conversational move (such as executing a discourse expectation) the grammar can then determine the most likely executor of this conversational move (i.e., by having the accessed routine use the expected speaker information contained in the discourse expectation).

This design choice of not beginning a conversational move with next speaker selection seems to be a good psychological model of actual discourse production. If we consider the point at which the grammar chooses a next speaker as that point in time when a conversant actually decides to speak, then it seems most probable that by the time a conversant has made this decision, s/he has at least performed enough initial processing to have an idea in mind of what s/he will say. That is, one would expect that conversants first consider their reaction to a previous speaker's statements (in the context of the discourse flow in general) and based on that reaction, decide whether or not they will perform a conversational move and if so what form it will take (e.g., getting back to a previously interrupted subject, agreeing with and therefore supporting the preceding speaker's statements, or not agreeing with and therefore challenging the preceding speaker's statements). It seems less likely, that, in general, without any prior processing, conversants just decide that it is their turn to speak and "speak they will." The type of processing performed by the grammar before it selects a next speaker is precisely deciding upon such high level conversational move decisions.

6.4 Illustrative example

To illustrate the operation of the discourse ATN and show how it uses the mechanisms described above, let us follow in some detail its modeling of the discourse in Excerpt 8, Chapter 4, repeated below. The order of presentation in this section is as follows: the excerpt; the current state of the discourse model by Line 9; an English description of the trace of the grammar in its simulated generation of Lines 9 - 11 of the excerpt.

6.4.1 The Excerpt

Excerpt 8

- A: 1. I think if you're going to marry someone in the Hindu
2. tradition, you have to - Well you - They say you give
3. money to the family, to the girl, but in essence, you
4. actually buy her.
- B: 5. It's the same in the Western tradition. You know, you
6. see these greasy fat millionaires going around with film
7. stars, right? They've essentially bought them by their
8. status (?money).
- C: 9. No, but, there, the woman is selling herself. In these
10. societies, the woman isn't selling herself, her parents
11. are selling her.

6.4.2 The Discourse Model

As explained above, the grammar updates its model of the discourse as each new conversational move is taken. In Excerpt 8, there are three conversational moves corresponding to each of the points made by the three speakers, A, B, and C:

- o Conversational Move 1: A's claiming that in the Hindu tradition men buy women as wives from the womens' families.
- o Conversational Move 2: B's claiming that in the Western tradition we have the analogous situation with men buying women as girlfriends.
- o Conversational Move 3: C's contesting the analogy on the grounds that while in the Western tradition women are their own agents in the selling transaction, in the Hindu tradition they are being sold by their families and are not the agents of their own selling.

Though in the above, distinct conversational moves happen to coincide with speaker shifts, in general, as mentioned earlier, there is no a priori connection between these two phenomena.

6.4.2.1 The Context Spaces

Each of these three conversational moves entails specification of a distinct substantive assertion, and each serves a unique communicative goal. Their corresponding discourse utterances are, therefore, partitioned into discrete, but related, context spaces. By Line 9, there are two context spaces in the discourse model: context space C1 corresponding to Lines 1 - 4 of the excerpt; and context space C2 corresponding to Lines 5 - 8.

Context space C1 is an Epistemic-Issue context space (TYPE: Epi), whose claim is that it is true that in the Hindu tradition women are sold as wives by their families.

As context space C2 presents an analogous claim to the claim presented in context space C1, during discussion of C2, C1 has a controlling state assignment. C1's being in a controlling state reflects that the utterances of C2 are said in direct relation to those of C1, and that C1 dictates what constitutes appropriate development of C2 (e.g., discussing women's wear in the West would currently be inappropriate).

Context space C2 is an Analogous-Epistemic-Issue context space (TYPE: Analogy-Epi). Its claim is that it is true that the situation in the West, vis-a-vis the selling of women, is analogous to the situation of woman selling

in the Hindu tradition. The following is the abstract proposition of which the claims of both the initiating and analogous context spaces are instances:

In location:cultural-traditions men buy object:women for a given function:escort from a given source:people.

In the formalizations given below, "cultural tradition," "women," "escort," and "people," are prefaced by "\$". This designates that these elements are the abstracted classes of which constituents mentioned in the analogous and initiating claims are members. So, for example, from C1, the constituent "the Hindu tradition" is a member of the class of \$cultural-traditions, while its corresponding constituent in C2, "the Western tradition," is also a member of this class.

The formal definitions of C1 and C2 are listed below.⁵⁸ (The slot names of these frame structures are capitalized.) For purposes of the trace, the reader need not dwell upon these formalizations in too great a detail.

Context Space C1:

TYPE	Epi
MODE	Explicit
MODALITY	Epistemic
CLAIM [
STATE-OF-AFFAIRS	In the Hindu tradition, you buy a girl as a wife from her family
PISTEMIC-PREDICATE	True]
TOPIC	Buying a girl as a wife in the Hindu tradition
SPEAKER	A
STATE	Controlling
FOCUS	
HIGH	Hindu tradition
MEDIUM	(Girl, Man, Girl's Family)

⁵⁸An implemented version would have the claims of the spaces in some predicate-calculus like semantic representation à la Webber [137].

Context Space C2:

TYPE Analogy-Epi
 MODE Explicit
 MODALITY Epistemic
 GOAL Pre-Generalization
 CONTEXTUAL-FUNCTION [
 Method Analogy
 CO-RELATOR C1]
 CLAIM [
 STATE-OF-AFFAIRS In the Western tradition, fat greasy millionaires buy film stars as girlfriends by spending money on them
 EPISTEMIC-PREDICATE True]
 TOPIC Buying a woman as a girlfriend in the Western tradition
 ABSTRACT
 RELATIONS (Buy)
 PROPOSITION (In Location:\$cultural-traditions man buys object:\$woman with money for function:\$escort from source:\$people)
 MAPPINGS ((location:\$cultural-traditions,
 Western tradition, Hindu tradition)
 (object:\$woman, film star, girl)
 (function:\$escort, companion, wife)
 (source:\$people, film star, girl's family)
 (buy object:\$woman with money for function:\$escort,
 buy film star with money as a companion,
 buy girl with money as a wife)
 (buy object:\$woman with money for function:\$escort from source:\$people,
 buy film star with money as a companion from film star,
 buy girl with money as a wife from girl's family)
 (In location:\$cultural-traditions man buys object:\$woman with money for function:\$escort from source:\$people,
 In western tradition, greasy fat millionaires buy film stars with money as companions from film stars,
 In Hindu tradition, man buys a girl with money as a wife from girl's family))
 SPEAKER B
 STATE
 FOCUS
 HIGH Western Tradition
 MEDIUM (Film star, Man)

6.4.2.2 The Registers

By Line 9, the following registers in the discourse model have been set:

- o **Expectation** = Nil; an expectation is neither being processed or constructed.
- o **Expectation-List** = Nil; since the presumed communicative goal is pre-generalization, the grammar does not set up a relate-analogy expectation: if the analogy is accepted, we do not expect resumption of the topic of the initiating space (i.e., the selling of women in the Hindu tradition), but rather, the conversation is free to go on and discuss the selling of women in general.
- o **CCS** = C2; the current active context space is C2.
- o **HEAD-CCS** = C1; the current controlling context space is C1.
- o **Discourse-Mode** = Discussion; we are not in the midst of discussing disputing claims.
- o **Type-Further-Challenge** = Nil; since we are not in the midst of debate we could not be in the middle of a further-challenge.
- o **Speaker** = B; B is the last conversant to generate discourse, and he is still holding the floor.
- o **Participant-List** = (A, C, D); D has spoken earlier in this conversation.
- o **Sides** = Nil; since we are not in the midst of a debate we do not currently have any opposing sides in the discourse.
- o **Future-Defender** = Nil; since we are not yet in the midst of debate, there is no challenged conversant of whom we must keep track.
- o **Domain-Constraints** = Nil; since we have not yet entered a debate we cannot yet have any conceded points.
- o **Analogous-Space** = Nil; an analogy has just taken place but it has not yet been contested, thus, this register is still Nil.
- o * = Nil; there is no current information being returned from a pushed to state.
- o **Re-Enter** = Nil; since we don't expect the situation in the Hindu tradition to necessarily be resumed, further subordination to the Western tradition does not pose a problem.

6.4.3 The Trace

In Figure 6D, a trace of the grammar in its simulation of Lines 9 - 11 of the excerpt is given. In this section, an extended English description of this trace is presented. It is recommended that readers refer to Figures 6A,B,C, and D, in their reading of this section. This will both enhance understanding of the section and a reader's familiarization with the formalisms.

The descriptions entail an analysis of all the states accessed (or specifically skipped over) by the grammar in its simulation of Lines 9 - 11. A general discussion is given of each such state, as is a specification of the transitions chosen for purposes of simulation.

6.4.3.1 Produce-Next-Move

Produce-Next-Move is the grammar's start state, wherein the paths of most conversational moves originate. In high level conceptual terms, the new conversational move can be related to the preceding discourse in one of five ways, as captured by choices A - E of this state. They are:

- o **Expectation:** execute a move predicted and/or required by preceding conversational development (e.g., answer a question, return to an interrupted context space, resume discussion of the subject matter of the initiating context of an analogy, etc.);
- o **Developmental1:** have the move be a developmental continuation of the preceding discourse but one not necessarily expected or mandatory (e.g., begin debate-of, support-of, comment-on, question-of, further-development-of, restatement-of, etc.);
- o **Developmental2:** same as Developmental1 with exclusion of starting a debate once already in debate mode;
- o **Nondevelopmental:** have the move be a nondevelopmental continuation of the preceding discourse (e.g., restart the discussion of a closed context space, abstract onto a topic logically prior to the one currently being discussed, attempt to interject something tangentially related to the current topic of discourse, etc.);

- o Transitional: generate a metastatement that will explicitly state the connection between the next conversational move and what went on before (e.g., "Speaking of discrimination, I wanted to tell you this story").

The grammar's simulated production of Lines 9 - 11, begins with the grammar in its start state. Since there are no outstanding expectations, and the discourse mode is discussion, the grammar can, among other options, choose to further develop discussion of the woman selling situation in the West; generalize onto the issue of women being sold the world over; totally leave discussion of the selling of women; resume discussion of the Hindu situation; or dispute the analogy cited. Simulating the discussion as it occurred, the grammar chooses the latter (i.e., transition to Start-Debate).

6.4.3.2 Start-Debate

The grammar recognizes two discourse modes: "discussion" and "debate." The Start-Debate state (which is a constructive state) is only accessible if we are in the discussion mode; once we are in a debate we cannot start one - it has already been started. A major feature of debate is conversants partitioning themselves onto opposing sides. In reflection, the grammar begins a debate by first choosing a next speaker, and then putting this speaker on one side of the debate and the preceding speaker on the other side. These initial sides are recorded in the Sides register, which is updated whenever a conversant changes sides on a debate or an unaligned conversant takes a side. This recording of sides enables the grammar to model the dynamic features of a debate wherein team members alternately oppose an opponent's argument.

In modeling Excerpt 8, the grammar chooses C as next speaker and it assigns ((B), (C)) to the Sides register. In addition, as we usually find conversants counter-challenging an opponent's challenge, the grammar at this point will also record that the preceding speaker (in this case B) is a likely Future-Defender of the claim about to be challenged.

Having prepared itself for subsequent debate, the grammar can now begin to subcategorize the forthcoming challenge move. It passes control to the organizational state, Challenge-Choice/Step 2, wherein such subcategorizations are performed.

In the midst of an ongoing debate, the Challenge-Choice/Step 2 state is usually reached via a transition from the Challenge-Choice/Step 1 state, whose major responsibility is next speaker selection. Since in preparation for debate, the grammar sets up its Sides register, a process which entails next speaker selection, the Start-Debate state specifically skips over this other speaker selection constructive state in the grammar. However, as I wish to give a comprehensive overview of the grammar, I will here briefly describe the actions of this state nonetheless.

6.4.3.3 Challenge-Choice/Step 1

The Challenge-Choice/Step 1 state can only be reached via the execution of a discourse expectation in the environment of an ongoing debate. Associated with the discourse expectation that leads us to this state is the name of the conversant whose counter-challenge is expected. In fulfilling its responsibility to select the next speaker, the routine utilizes this expected speaker information in one of two ways:

1. push to the Shift-Speaker-Expectation state, wherein the expected speaker is selected as next speaker;
2. push to the Shift-Speaker-Same side state, wherein:
 - a. a conversant already known to be on the same side of the argument as the expected speaker is selected as next speaker;
 - b. a previously uncommitted speaker is selected as next speaker. This conversant is appended onto the expected speaker's side of the debate (i.e., updating of the Sides register);
 - c. a conversant from the other side switches sides and is selected as next speaker. This allows the last speaker to

hold the floor and allows for "sincere" switching and "devil advocate" playing. This change in a conversant's position is recorded in the Sides register.

In all cases, the speaker last holding the floor is assigned the Future-Defender role⁵⁹.

Having selected a next speaker, and having assigned the Future-Defender role to the preceding speaker, the grammar is now ready to further subcategorize the form of challenge to be given. Like in the Start-Debate case, control is passed to Challenge-Choice/Step 2, wherein such decisions are made.

6.4.3.4 Challenge-Choice/Step 2

There are three major subcategorizations of a challenge conversational move:

1. The Direct Challenge Form: a conversant either emotively undermines an opponent's claim; demands that the opponent support a claim or unsubstantiated dismissal-challenge; or, makes an assertion which directly opposes the opponent's.
2. The Indirect Form: a conversant does not verbalize explicit disagreement with an opponent's claim, but rather, cites a claim, which if true, implies that the opponent's claim is either not true, irrelevant, or only one skewed version of the truth.
3. The Support Form: a conversant responds to an opponent's demand that s/he support a claim. As this move occurs in response to an opponent's challenge (of the demand support category), it is treated as a counter-challenge much as are other responses to an opponent in a debate.

⁵⁹This is appropriate even for a speaker countering his/her own preceding claim, because in such situations a speaker usually equivocates between the two positions and frequently follows the "switched side position" with a "But, on the other hand," returning to the first position put forward.

A conversant is always free to choose a direct or indirect form of challenge except in the case where s/he is expected to respond to an opponent's preceding demand for a claim-support. In cases of an outstanding support demand, the grammar, following maxim-abiding discourse development, limits subsequent transition to the support state.

C's conversational move begins the debate; she is under no demand to support a preceding claim. The grammar at this point therefore is free to choose either an indirect or direct form of challenge. Modeling C, it chooses the direct form of challenge (transition to the Challenge-Directly/Step 1 state of the grammar).

Before passing control, however, the grammar (1) appends the current speaker onto the antagonist list of CCS, i.e., C is appended onto C2.Antagonists; and (2) creates the discourse expectation that the current speaker (C) may, at a later point in time, further challenge the Future-Defender's (B's) preceding claim (context space C2). As will be illustrated in Chapter 7, creating "Further-Challenge" expectations enables the grammar to cleanly model discourse pops incurred either when a conversant fixes some flawed subargument, or when a team member follows a speaker's subargument challenge with additional argumentation against the opponent's argument that led to current subargumentation.

Further challenge expectations are not created, though, under the following conditions:

1. The current speaker is challenging an opponent's preceding flat dismissal of her/his argument in CCS (i.e., CCS.Comment.Contextual-Function.Method = "Flat-Rejection"). One only has two means of countering a flat dismissal: (1) accept the dismissal and concede the subargument; or (2) demand the opponent to replace the unsubstantive challenge with a substantive one. There is no room here for further-challenges.
2. The current speaker is responding to an opponent's demand that s/he support an earlier claim (i.e., Expectation.Associated-Constraints = "Supply-Support-Claim"). In this case, the challenge is really just supporting one's own claim in CCS; setting up a further-challenge of this context space by its protagonist is inappropriate.

3. The current speaker is responding to an opponent's demand that s/he give a substantive challenge against CCS in place of her/his earlier unsubstantive challenge (i.e., Expectation.Associated-Constraints = "Supply-Support-Rejection"). In this case, the further-challenge expectation set up when the conversant first challenged CCS with the flat dismissal is still on the expectation-list register; the challenge currently being processed is the counterchallenge expectation to the support demand. A new further challenge need not be set up.

The grammar's transitions to both the direct and indirect subcategories of a challenge move, are achieved by a push rather than a go. As a result, upon completion of these states, control is returned to its next action, i.e., the Challenge-Choice/Step 3 state of the grammar. This re-merging of paths corresponds to the grammar's construction of a counter-challenge expectation for the Future-Defender (regardless of the opponent's form of attack).

6.4.3.5 Challenge-Directly/Step 1

There are many ways of directly attacking an opponent's argument. Within a given discourse context, however, only some of these types of attack are applicable or sensible. Corresponding to each possible form of attack, a distinct arc transition emanates from this state. The transition tests on the arcs capture the context sensitive features of these different developmental options.

There are three conceptual subcategorizations of a direct challenge:

- o Emotive/Questioning Challenges: keeps the burden of proof on the opposition; it undermines an opponent's position but it does not cite any evidence or specific claims against it; for example, a "So What" type of challenge (transition to the "Emotive-Flat-Rejection" state);
- o Substantive Challenges: entails involving oneself into the validity of the opponent's argument, usually by citation of some contrary claim and/or evidence against it; for example, denying the truth of the opponent's claim or support-fact (transition to the "Deny-Truth-Challenge" state);
- o Subargument-Concession: entails conceding a flaw in one's argument,

followed either by ending all debate (i.e., total concession) or by a fixing of the flawed argument.

As noted, choosing any one of these direct challenge forms, and their many forms of subcategorization, is constrained by preceding conversational development. For example, given no preceding challenge, a subargument concession is clearly inappropriate. In C's case, a number of transitions are blocked (such as the one just cited above), while many others are possible. C chooses a substantive form of challenge.

As noted earlier, a conversant can either challenge an opponent's claim (i.e., issue context space), or s/he can challenge an opponent's support for a claim (i.e., supportive context space). The grammar's first action along the substantive challenge form is to decide whether to attack an opponent's claim or support of such. The following is a brief summary of the possible updating actions that the grammar will have to perform based on which option it chooses and its current model of the discourse.

Active Issue Context Space:

- o If a challenge-support option is chosen, the grammar must reassign the active issue space to "generating;" reassign its high focus element to a medium focus; and reactivate the last supportive context of the issue space as active.

Active Supportive Context Space:

- o If the grammar chooses the challenge-claim option, the grammar must close the active supportive context space; reassign its focus level assignments to zero; and reinstantiate the issue space, currently pointed to by HEAD-CCS, as the active context space.

In the case of Excerpt 8, as B has not supported his analogous claim, the only viable option at this point is a direct attack on the analogous claim itself. Since the active context space is B's issue context space, no updating must be performed at this point.

As all substantive challenges (Choice E)⁶⁰ entail citation of a substantive assertion in direct opposition to a speaker's position, they are usually prefaced with the clue word(s), "(No), but."⁶¹ In counterchallenge of opponent's argument, however, which entailed citation of a state of affairs that did not occur, the clue words "Well, of course," or "But, of course," can be used as well. This stems from the generally known fact that usually one only asserts that an event did not occur, if there is some reason to have believed that it would: the reason for believing it would occur is one's claim. The opponent, showing that the event did not occur, thereby proves the invalidity of one's claim (i.e., argumentation involving some form of Modus-Tollens). To counter such an argument, a defender of the original position, must illustrate that this nonoccurrence does not violate predictions of the initial argument, and that, on the contrary, its nonoccurrence is quite consistent and expected by the initial position (i.e., the "unexpected" event is not unexpected at all). Hence, the use of "Well, of course," or the like, in such counter-argumentation.

However, if the challenge being generated is a further challenge of a context space, these clue words noted above are not generated. In the case of a further challenge, the clue words "And, furthermore," or the like, are generated instead. Corresponding to this qualification, before generating

⁶⁰The extended form of an Irrelevance-Rejection, Choice A/2, also entails citing a substantive challenge. Its short form, however, does not. The short form serves the same function as a "So What" type of challenge in that it merely entails the speaker restating the opponent's claim with an explicit disclaimer that this claim is not at issue. D's utterance on Line 17, Excerpt 1, "It has nothing to do with the child's home," constitutes the short form of the challenge. His subsequent utterance, "It has to do with the child's environment," constitutes using the long form, as a new substantive assertion is made.

⁶¹The long form of Choice A/2, though substantive, is not prefaced with a "No, but," as only its first half entails negative assertion; the second half entails positive assertion of what is at issue.

these clue words along this transition path, the grammar first checks its Type-Further-Challenge register to insure that it is not processing a further challenge.

C's move on Line 9 begins the debate; she is not responding to a Modus-Tollens challenge, nor is she further challenging an opponent's argument. Satisfying maxim-abiding constraint tests, the grammar can now generate the clue words "No, but," which accompany C's move on Line 9 of the excerpt.

This design choice of clue word generation before full subcategorization of the conversational move to be performed, correctly models some prosodics found in conversational speech, i.e., a person's use of a clue word, pause, and later substantive speaking. The later choosing of one of the subchoices of Choice F, and the initial processing done along each of these paths, can give us some insight into what type of processing a conversant might be performing during this pause period between the uttering of a clue word and the later uttering of substantive remarks.

There are still a number of subcategorization decisions and corresponding updating actions to be performed before C's subsequent substantive challenging utterances can be generated. Some of the subcategorizations have additional applicability tests: Choice E/A is only appropriate as a counterchallenge to specifics of an opponent's preceding support space; Choice E/C is only appropriate as a counterchallenge to a preceding "New-Factor" type of challenge; while Choice E/F is only appropriate against a preceding analogy. While the current discourse context does not satisfy the transition criteria for subchcices A and C, it does satisfy that of subchoice E/F: B's claim does involve an analogy (i.e., CCS.Contextual-Function.Method = "Analogy"). The grammar chooses this transition path.

In its first action on this transition arc, the grammar sets its Analogous Register to the analogous context space about to be challenged (i.e., the current active space). This register is set to ensure that during the challenge, the initiating space of the analogy (here, C1) remains in its controlling status, and that the analogous space (here, C2) is reassigned a generating state. This reflects that of the two spaces to be cited in the

forthcoming challenge, the initiating space is the one of higher influential status.

Having set this register, the grammar can now call on the constructive routine (called for all options in Choice E) wherein a new issue context space is constructed (here, C3). The following slots of the new space are immediately filled:

Goal:	Challenge
Mode:	Explicit
Co-Relator:	The context space being challenged (i.e., CCS, here, C2)

The next action of this constructive state is to update the relevant discourse context in preparation for subsequent generation. The newly created space is assigned an active state and CCS is reset to point to it. In addition, usually the preceding controlling context space is reassigned a generating state, and the preceding active space, a controlling state. In the case of analogy rejection, however, the controlling space (i.e., the initiating space of the analogy) is left controlling, and the preceding active space (i.e., the analogous space) is reassigned to generating.

After this discourse model updating, control is passed to the state specified along the transition chosen; in this case, to the Challenge-Analogy-Mappings state.

6.4.3.6 Challenge-Analogy-Mappings/Step 1

As explained earlier, analogy rejection usually rests on some nonidentity of relations between the correspondent domains, where this nonidentity either undermines the communicative goal of the analogy or undermines the very relation being claimed constant between the two domains. As the communicative goal of B's analogy is presumably "Pre-Generalization" (a very amorphous form of goal), C's rejection entails challenging the constant relation being asserted: the "BUY" relation.

Formally, C's rejection takes the form of asserting a non-correspondence

of relation involving slot fillers of the mappings set up in the analogy: in the Western case there is an IDENTITY relation between the role fillers of the \$Source and \$Object case slots of the BUY relation, whereas, in the Hindu case this relation does not hold. This non-correspondence between the domains is highly relevant to current discussion because ownership by the sellee is a precondition for a legal buying; it ENABLES a BUY: this ownership relation is true in the Western case but it is not true in the Hindu case.

The grammar's formalization of this form of analogy rejection message (cf., Challenge-Analogy-Mappings, Figure 6C), is in terms of one's being able to infer such a set of enabling relations between the constant relations of the analogy (Analogous-Space.Abstract.Relations) and slot fillers of its Mappings slots. The grammar uses its earlier explication of the implicit connections between B's analogous utterances and A's initiating ones in order to formalize the message to be generated.

After generation, the grammar records in its discourse model the message generated and further updates the effects of such a challenge move on a discourse context. It begins by putting a propositional representation of this generated message into the Claim slot of the active context space. It then pops back to its caller, Challenge-Directly/Step 1, where further updating, common to all forms of substantive direct challenges, is performed.

6.4.3.7 Challenge-Directly/Step 2

All forms of substantive challenging entail creation of a new challenge issue context space. This new issue space is inserted into the Counterclaim or Countersupport slot of the opponent's debative-issue space just challenged. The grammar uses the Goal slot of HEAD-CCS (the space being challenged except in cases of analogy-mapping rejection) to determine which is appropriate (i.e., Goal = "Support" then insert the new challenge space as a countersupport to the issue space pointed to by the support space; else insert the new challenge space as a counterclaim to the issue space being challenged, pointed to by a Co-Relator slot of the new space). In analogy mapping rejection, the case at

hand, HEAD-CCS will point to the issue context space that initiated the analogy; accordingly, HEAD-CCS.Goal NE "Support" and the new challenge space, C3, is inserted into the Counterclaim slot of its Co-Relator, C2, B's analogous space being challenged. The grammar then passes control to its caller, Challenge-Choice/Step 2, wherein some further updating of the discourse model, common to both direct and indirect forms of attack, is performed.

6.4.3.8 Challenge-Choice/Step 3:

Having processed the challenge, the grammar appends to the Expectation-List register the expectation that the person challenged (i.e., the conversant assigned to the role of Future-Defender) will respond with a counter-challenge to this challenge. In the case of Excerpt 8, the grammar appends onto the Expectation-List register the following discourse expectation: (Challenge-Choice, B, C3).

Having completed processing of this conversational move, the grammar returns to its start state, Produce-Next-Move, wherein it begins to process the subsequent move in the discourse and a new cycle through the ATN commences.

At this point, let's turn to some of the specific arc transition tests which forestall inappropriate conversational development.

6.5 Violations of pretests

As discussed in Section 6.4, before the grammar takes a state transition, it performs a number of tests to ensure that the discourse context warrants such a transition. I now present pieces of discourse whose generation would entail violation of such transition tests. The reader will notice that these passages seem incoherent, strange, and unresponsive to a preceding conversant's conversational move.

For purposes of illustration, let's return to some arc transitions in the Challenge-Directly/Step 1 state that the grammar bypassed in its simulation of Lines 9 - 11 of Excerpt 8. For each test along a transition arc re-visited, I present a short piece of dialogue in violation of such a test.⁶² All utterances (except those prefaced with a * or otherwise noted) are taken directly either from Excerpt 1 or sections of discourse preceding or succeeding this genetic-environmental debate, which occurred in a naturally ongoing conversation between friends. Test numbers used within the descriptions correspond to the numbering system used in Figures 6A and B. '*' is used to indicate the unacceptability of the move taken.

Emotive-Flat-Rejection: A response of the form "So what," "Big deal," or "That means nothing," constitutes an emotive-rejecting challenge. Used appropriately, it can be quite an effective form of attack and undermining of one's opponent, since a major point in argumentation is that your opponent recognize the impact of your statements on his or her preceding claim (Choice A/1).

At times, however, this form of attack is inappropriate and if used would either be totally incoherent or, at best, could only be taken sarcastically. Below, for each transition test accompanying this choice, an example of dialogue in violation of the test is presented.

Test 1: Expecting Support of an Unsubstantiated Flat Rejection

- R: 1. Son of Sam killed a woman, right? By keeping him in
2. jail - I know this is disgusting, but still - by keeping
3. him in jail alive, that woman whose daughter was killed
4. by this guy, she's paying her taxes to have this man
5. fed. Why should she?

⁶²I would just like to remind the reader that in addition to the constraints presented below, these transitions are also blocked by an antagonist's preceding conversational move of demanding a protagonist to give supportive evidence of a claim just made. In such cases, transition to the Challenge-Directly/Step 1 state is itself forestalled by a preceding transition test.

M: 6. Well, that doesn't impress me at all.

R: 7. Why not?

M: * So what?

M's move on Line 6 is a Flat-Emotive-Rejection challenge. R's counter-challenge demands that M replace her unsubstantiated dismissal with a substantive challenge. Responding to such a demand with a "So what," is incoherent: assertions, not demands, warrant emotive flat rejection.

Test 2: After Denial of Truth

D: 28. It has to do with the child's environment.

R: 29. Right, but, the two brothers have the same environment.

D: 30. They do not have the same environment.

R: * So What.

A "So what" response, while undermining of an opponent's position, gives implicit acceptance to its truth. Given that the opponent's position directly denies one's own assertion, giving such implicit acceptance is self-contradictory. In addition, an opponent's denial of the truth of one's claim is always undermining and relevant to one's position in an argument. Therefore, countering such a challenge with a flat emotive response, at best, reflects some skewed reasoning process.

Test 3: After a Flat Rejection

R: 3. by keeping him in jail alive, that woman whose daughter
4. was killed by this guy, she's paying her taxes to have
5. this man fed. Why should she?

M: 6. Well, that doesn't impress me at all.

R: * So what.

To respond to an emotive or irrelevance rejection with an emotive flat

rejection is at best sarcastic, since in a debate it is clearly relevant if your opponent does not recognize the importance of your argument.

Test 4: After Apply-Expansion

R: 26. So you couldn't blame it on the child's home.

D: 27. It has nothing to do with the child's home.
28. It has to do with the child's environment.

R: 29. Right, but, the two brothers have the same environment.

D: * So what?

D's challenge on Lines 27 - 28 is the extended form of an Irrelevance-Rejection challenge. In this form of challenge, one first dismisses the scope of an opponent's claim (claiming that it is irrelevant to the subject of discussion), and then one specifies what one considers to be the actual scope of relevance. Having just claimed that the scope at issue is X, and an opponent argues that her/his claim supports such a scope, one cannot then dismiss the opponent's claim as irrelevant: the opponent has just addressed the issue which you yourself have claimed is relevant.

Demand-Support-Rejection: The appropriate context for a demand-support-rejection is an opponent's preceding emotive rejection of one's claim. It entails one's generating a "why" question which is interpreted as a demand that the antagonist replace her or his preceding unsubstantiated dismissal with a substantive challenge (Choice B).

As this form of challenge does not entail citation of any substantive assertion, its generation does not result in a shift in context space or re-

establishment of a relevant discourse context⁶³. Rather, it results in the grammar creating the discourse expectation that the addressed speaker will, on her or his next turn, provide such a substantive challenge (i.e., the Associated-Constraints slot of the counter-challenge expectation for the Future-Defender is set to "Supply-Support-Rejection").

Given a preceding emotive-flat-rejection or the short form of an irrelevance-rejection (i.e., CCS.Comment.Contextual-Function.Method = "Flat-Rejection") this form of challenge is appropriate. Given an intervening demand-support-rejection, it is not. The grammar, therefore, has two transition tests along this arc: (1) ensure the antagonist has previously given an unsubstantiated dismissal of the protagonist's claim (by checking the method of the comment slot of CCS); and (2) ensure that there has been no intervening demand-support (by checking the Expectation register). The excerpt below illustrates violation of this second test.

Test 1: Expecting Support of an Unsubstantiated Flat Rejection

R: 3. by keeping him in jail alive, that woman whose daughter
4. was killed by this guy, she's paying her taxes to have
5. this man fed. Why should she?

M: 6. Well, that doesn't impress me at all.

R: 7. Why not?

M: * Why?

⁶³Similarly, flat rejections do not result in re-establishment of a relevant discourse context. They do, however, result in the creation of a comment "space", which will temporarily fill the slot of the active space's claim slot. The comment space is not a full-fledged context space as it does not have an associated State slot, any slots corresponding to implicit components of a move, or any subconstituents. In fact, when a substantive challenge is given in place of the flat rejection, the grammar undoes the status of the comment lying in a separate subordinate space, by transferring the comment onto a list of all comments given to the space in an "Oldcomment" slot. This enables the grammar to distinguish comments just stated from ones stated awhile ago in the discourse.

On Line 6, M emotively flatly rejects the importance of R's argument. On Line 7, R demands support for this emotive flat rejection. M's subsequent "why" response is highly irregular since a major aspect of the set of acknowledged rules governing informal debate is that conversants can demand opponents to support their claims and attitudes, and that opponents in turn answer such requests. To ask an opponent why s/he wants you to support your earlier stated position is a violation of this rule.

Argument Concession: Subargument concession can either entail total concession with an ending of all debate, or only partial concession followed by one's "fixing" of a subargument. As noted earlier, the latter form of this move, usually entails some discourse popping and a recursive transition to the challenge state of the grammar, wherein the speaker generates some replacement subargument by re-challenging (from another vantage point) an opponent's context space that has led to the lost subargument (Choice D).

There are two constraints along this path: (1) there must be something to concede at this point, and (2) this must be an initial challenge of an opponent's argument. The excerpt below (not taken from actual discourse) illustrates violation of the first of these constraints.

Test 5: After a Non-Challenge

SP1: It's a beautiful day today.

SP2: Yeah, isn't it?

SP1: * All right, but, X.

Test 6: Not a Further Challenge

As to be more fully described in Chapter 7, further challenges come about from one of two reasons: (1) preceding concession of a subargument; or (2) a team member (or oneself) giving further argumentation against a prior claim that has led to current subargumentation (i.e., popping back to the context space that caused this yet nonconceded subargument and further attacking). Neither situation warrants subargument concession.

Case 1: Previous Concession:

Previous concession means that we have reached this state on a recursive call to it after having popped the discourse environment and having already generated the clue words, "All right, but." Clearly, if we've just come from this state with no intervening argumentation, a second transition of it is not warranted (i.e., we would inappropriately allow for double generation of the clue words "All right, but," and popping of the discourse context).

Case 2: Joining Forces:

The joining forces situation always entails a succession of argumentation by one side of the debate, and corresponding discourse popping. It is facilitated by executing a Further-Challenge expectation; transition to the Further-Challenge state, wherein the grammar pops its discourse model, and subsequent transition to the Challenge-Choice state. Subargument concession, which involves generation of the clue words "All right, but," always entails concession of an immediately previous argument, not one popped back to. The moves, therefore, are inconsistent with one another. In addition, the immediately previous argument in this context, is necessarily one of the current speaker's side. One does not usually concede arguments to team members.

6.6 Conclusions

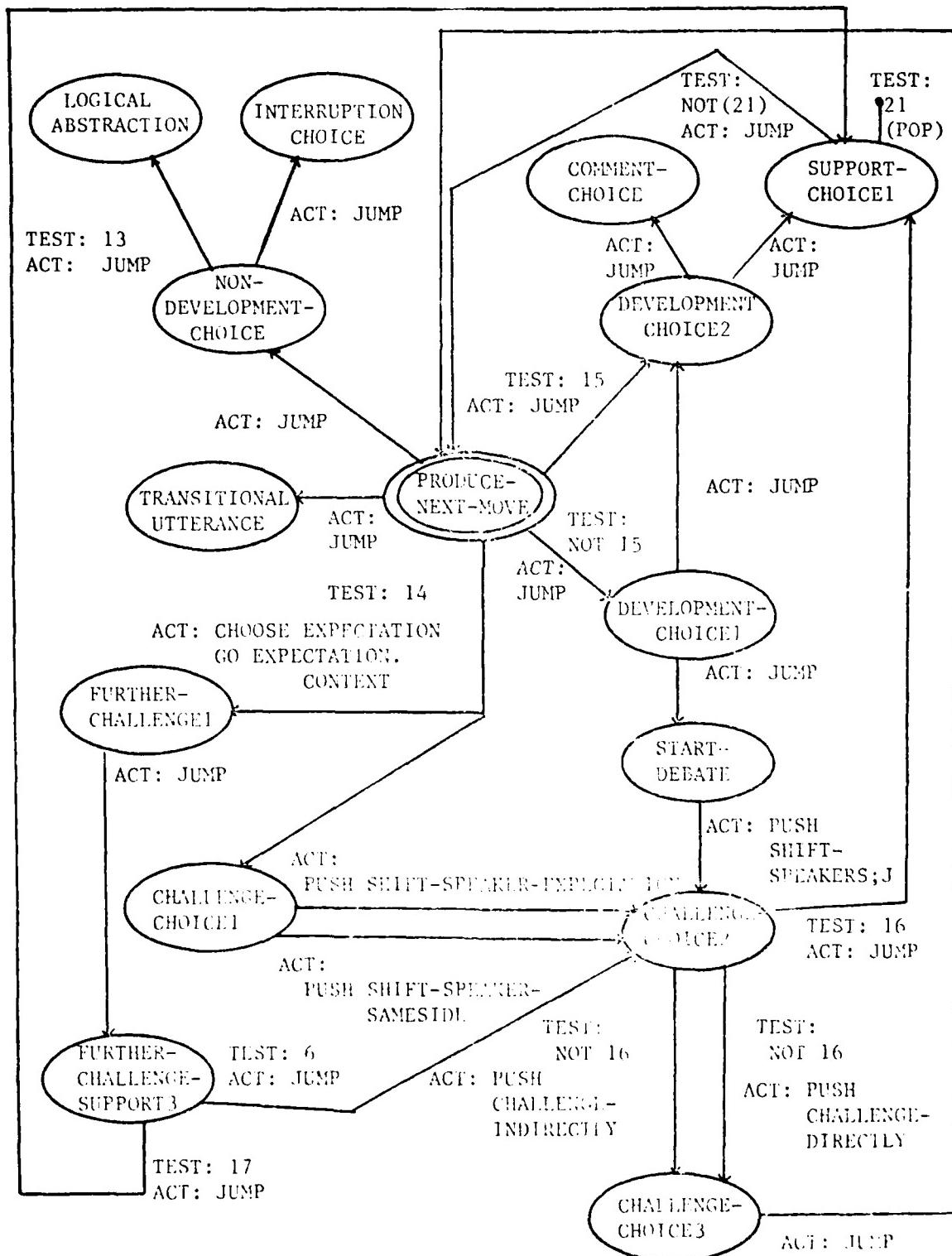
This chapter has been presented as a means of giving the reader a feel for the grammar's operation on an actual piece of discourse. It has hopefully illustrated how the grammar's tracking of the effects of preceding conversational moves enables it to:

- o constrain inappropriate conversational development;
- o predict and execute most likely forms of subsequent development;
- o formalize messages to be generated in fulfillment of a given type of communicative goal.

The effects tracked by the grammar include, among others, explication of implicit components of conversational moves. It is in terms of such explicated components that the grammar is able to formalize the connection between subsequent and preceding discourse utterances.

In addition, it has been illustrated that much of the grammar's design is consistent with a cognitive model of the communicative process: cues; expectations; segmentation; relevant context identification; point of speaker selection; point of clue word generation; and non-simultaneous choice and rejection of a form of thematic conversational development. Lastly, the grammar's design maximizes merging of transition paths in reflection of those points where differentiation matters and those where it does not.

FIGURE 6A:
ATN REPRESENTATION



AD-A103 566

BOLT BERANEK AND NEWMAN INC CAMBRIDGE MA

F/G 5/7

PLAIN SPEAKING: A THEORY AND GRAMMAR OF SPONTANEOUS DISCOURSE.(U)

N00014-77-C-0371

JUN 81 R REICHMAN

NL

UNCLASSIFIED

BBN-4681

3 in 5
R
BBN-4681

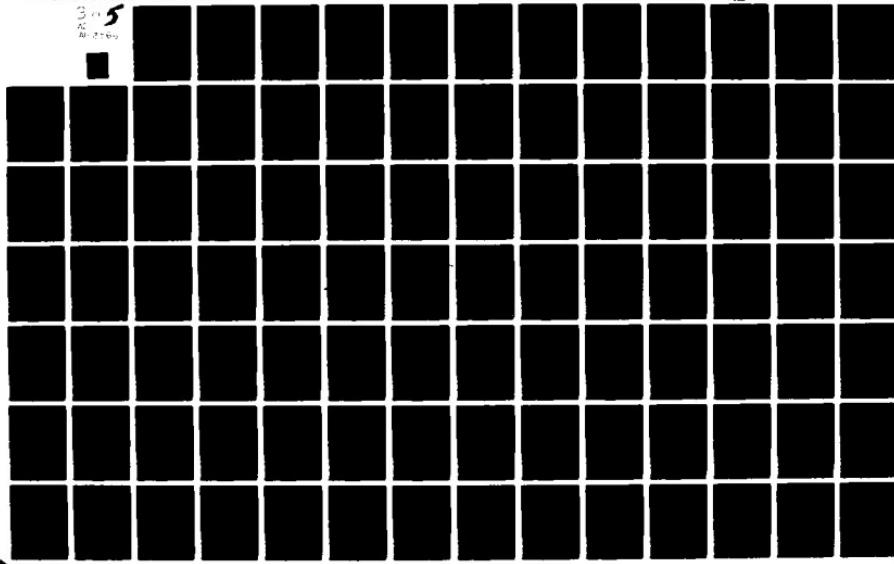


FIGURE 6A, cont.

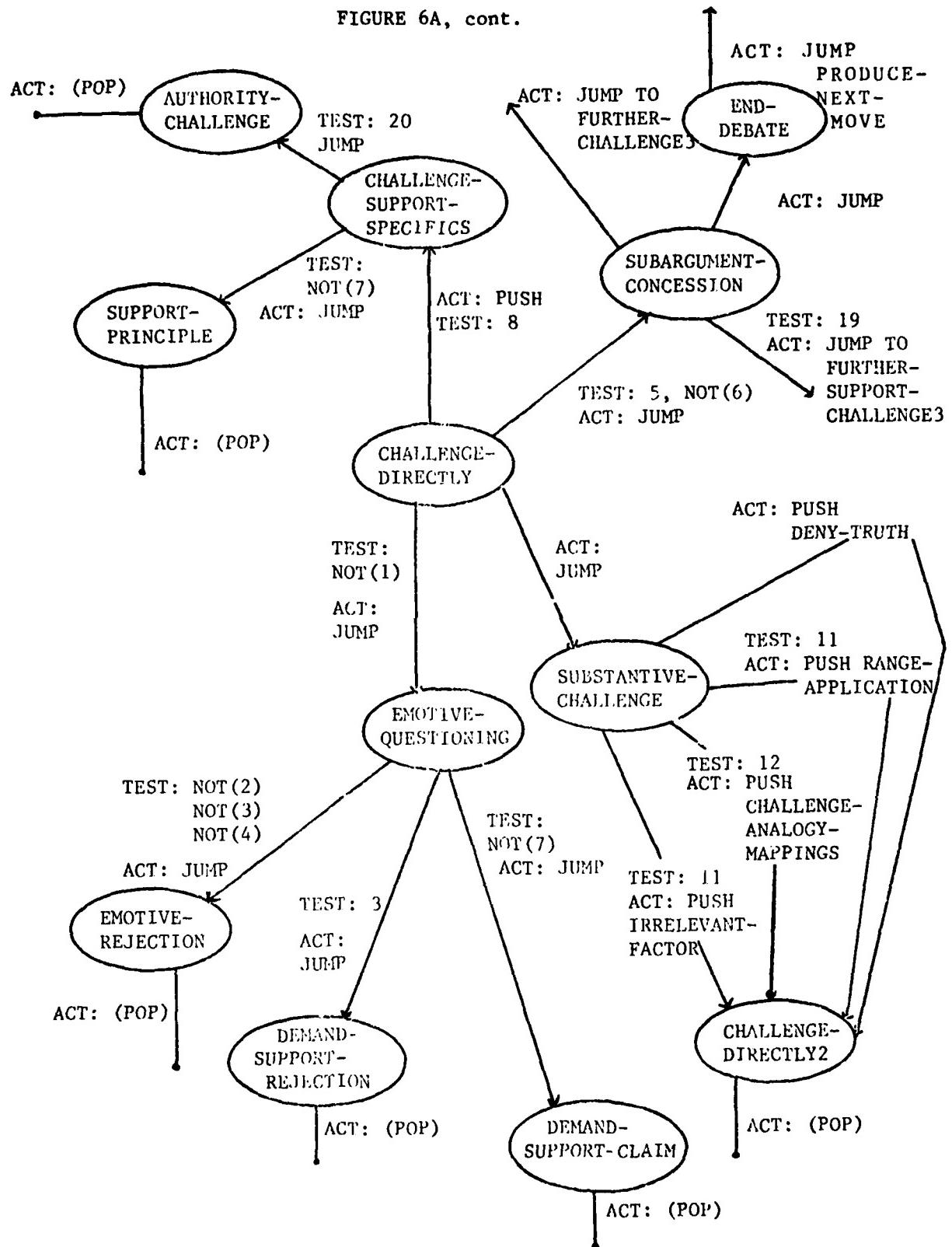


Figure 6B:**Tests Applicable in Traversals:****1. Expecting Support of an Unsubstantiated Flat Rejection**

Discourse expectation predicts that the antagonist will actually engage into the validity of the protagonist's position. This expectation results from a protagonist's demand that the antagonist back-up her or his preceding emotive flat rejection or irrelevance rejection of the protagonist's earlier argument.

Expectation.Associated-Constraints = "Supply-Support-Rejection"

2. After Denial of Truth

The speaker is counter-challenging an opponent's preceding challenge of the truth of the current speaker's preceding claim.

For Some I, CCS.Contextual-Function.Method{I} = "Deny-Truth"

3. After Unsubstantiated Flat Rejection

Current speaker is counter-challenging a "So what" or "The X which you speak of has nothing to do with anything" type of challenge.

CCS.Comment.Contextual-Function.Method = "Flat-Rejection"

4. After Apply-Expansion

The speaker is counter-challenging an opponent's claim that her/his argument does support the scope of relevance claimed by the speaker.

For Some I, CCS.Contextual-Function.Method{I}
= "Apply-Expansion"

5. After a Preceding Challenge

The speaker is responding to a previous challenge, i.e., is counterchallenging.

CCS.Goal = "Challenge"
Or
(CCS.Goal = "Fix-Claim"
And
For Some I,
CCS.Contextual-Function.Co-Relator{I}.Goal

= "Challenge")
Or
(CCS.Goal = "Support"
And
(HEAD-CCS.Goal = "Challenge"
Or
(HEAD-CCS.Goal = "Fix-Claim"
And
For Some I,
HEAD-CCS.Contextual-Function.Co-Relator{I}.Goal
= "Challenge")))

6. Further-Challenge

This is a second challenge to an opponent's claim, where this second challenge may have been immediately preceded by clue words like "All right, but," i.e., a subargument concession.

Type-Further-Challenge = "Challenge"

7. No Preceding Propositional Support

Opponent has never given propositional support to her or his preceding claim.

CCS.Goal NE "Support"
Or
CCS.Support-Fact = Nil
Or
CCS.SupportCS = Nil
Or
CCS.SupportCS.Support-Fact = Nil

8. Some Existing Support of Preceding Claim

Some support was given to the claim being challenged, at minimum, the citation of some authority for the truth of the claim.

CCS.Goal = "Support" Or CCS.SupportCS NE Nil

9. After Expansion Challenge

Current speaker is counter-challenging a "Y is what is important here" type of challenge.

For Some I, CCS.Contextual-Function.Method{I}
= "Irrelevance-By-Expansion"

10. After an Epistemic Claim

The modality of the claim being challenged is True/Not True, or Necessary/Not Necessary.

CCS.Modality = "Epistemic"

11. After a New-Factor Challenge

Counterchallenging a counterchallenge that implied that the preceding claim was not valid due to an attribute of the class or entity under discussion.

For Some I, CCS.Contextual-Function.Method{I} = "New-Factor"

12. After an Analogy

Responding or arguing with an analogy.

For Some I, CCS.Contextual-Function.Method{I} = "Analogy"

13. Evaluative Claim Under Discussion

CCS.Modality = "Evaluative"

14. Some Outstanding Discourse Expectations

Expectation-List NE Nil

15. In Debate Mode

Discourse-Mode = "Debate"

16. Expecting a Demanded Support for a Preceding Claim

Expectation.Associated-Constraints = "Supply-Support-Claim"

17. Supporting a Preceding Counterclaim

Type-Further-Challenge = "Support"

18. Subordinating to a Controlling context space

Re-Enter NE Nil

19. Conceded a Support as Flawed

rejected-space.Goal = "Support"

20. Some Authority for the Claim has been Cited

CCS.Authority NE Nil OR HEAD-CCS.SupportCS.Authority NE Nil

21. Just Generated Support for an Implicit Challenge

HEAD-CCS.Mode = "Implicit"

Figure 6C:

Program Representation

Produce-Next-Move:

```
Choose ( A: If Not(Expectation-List = Nil)
         Then Expectation
               <-- Choosed(Expectation-List)
               Go Expectation.Function

         B: If Discourse-Mode NE "Debate"
             Then Go Developmental-Choice/Step 1

         C: If Discourse-Mode = "Debate"
             Then Go Developmental-Choice/Step 2

         D: Go NonDevelopmental-Choice

         E: Go Transitional-Utterance)
```

Developmental-Choice/Step 1:

```
Choose (A: Go Start-Debate/Step 1
       B: Go Step 2)
```

Step 2:

```
Choose( A: Go Further-Development-Choice
        B: Go Pre-Generalization-Choice
        C: Go Generalization-Choice
        D: Go Negative/Positive-Evaluative-Choice
        E: Go Explain-Choice
        F: Go Question-Choice
        G: Go Comment-Choice )
```

Start-Debate/Step 1:

```
Discourse-Mode <-- "Debate"
Future-Defender <- Speaker
side{1}           <- (Speaker)
```

Choose (A: Push Shift-Speakers

B: Go Step 2)

Step 2:

```
side{2} <-- (Speaker)
Sides    <-- (Side{1},Side{2})
```

Go Challenge-Choice/Step 2

Shift-Speakers:

```
oldspeaker <- Speaker
Speaker     <- Choosed(Participant-List)
oldspeaker APPEND Participant-List
```

(POP)

Challenge-Choice/Step 1:

Future-Defender <- Speaker

Choose(A: Push Shift-Speaker-Expectation

B: knownside <-- Expectation.Speaker
Push Shift-Speaker-Same side)

Step 2:

If Not(CCS.Comment.Contextual-Function.Method
= "Flat-Rejection")

AND

(Expectation.Associated-Constraints
NE "Supply-Support-Claim"
OR
"Supply-Support-Rejection")

THEN (Further-Challenge, Speaker, CCS)

APPEND
Expectation-List

```
If Expectation.Associated-Constraints
  = "Supply-Support-Claim"
THEN Expectation.Associated-Constraints <-- Nil
Go Support-Of
ELSE If CCS.Goal NE "Support"
  THEN If Not(Speaker MEMBER CCS.Antagonists)
    THEN Speaker APPEND CCS.Antagonists
  ELSE If For Some I,
    Not(Speaker
      MEMBER
      CCS.Contextual-Function
      .Co-Relator{I}.Antagonists)
    S.T. CCS.Contextual-Function.Method{I}
      NE "Inference-Of"/"Derived-From"
  THEN Speaker
    APPEND
    CCS.Contextual-Function
    .Co-Relator{I}.Antagonists
```

Choose (A: Push Challenge-Directly/Step 1

B: Push Challenge-Indirectly)

Step 3:

```
Expectation <-- [
  Function <-- Challenge-Choice
  Speaker <-- Future-Defender
  Context <-- CCS ]
```

```
Expectation APPEND Expectation-List
Expectation <-- Nil
Type-Further-Challenge <- Nil
Go Produce-Next-Move
```

Challenge-Directly/Step 1:

CHOOSE (

```
A: If Not(Expectation.Associated-Constraints
  = "Supply-Support-Rejection")
  AND
  Not(For Some I, CCS.Contextual-Function.Method{I}
    = "Deny-Truth")
```

AND
 Not(CCS.Comment.Contextual-Function.Method
 = "Flat-Rejection")
 AND
 Not(For Some I, CCS.Contextual-Function.Method{I}
 = "Apply-Expansion")

Then Choose(1: Go Emotive-Flat-Rejection

2: Push Irrelevance-Rejection
 If * EQ Nil THEN (POP))

B: If Not(Expectation.Associated-Constraints
 = "Supply-Support-Rejection")
 AND
 CCS.Comment.Contextual-Function.Method
 = "Flat-Rejection"

Then Go Demand-Support-Rejection

C: If Not(Expectation.Associated-Constraints
 = "Supply-Support-Rejection")
 AND
 Not(CCS.Comment.Contextual-Function.Method
 = "Flat-Rejection")
 AND
 (CCS.Goal NE "Support"
 Or
 CCS.Support-Fact = Nil
 Or
 CCS.SupportCS = Nil
 Or
 CCS.SupportCS.Support-Fact = Nil)

Then Go Demand-Support-Claim

D: If Type-Further-Challenge EQ Nil

AND

(CCS.Goal = "Challenge"
 Or
 (CCS.Goal = "Fix-Claim"
 And
 For Some I,
 CCS.Contextual-Function.Co-Relator{I}.Goal
 = "Challenge")
 Or

```
(CCS.Goal = "Support"
  And
  (HEAD-CCS.Goal = "Challenge"
    Or
    (HEAD-CCS.Goal = "Fix-Claim"
      And
      For Some I,
        HEAD-CCS.Contextual-Function.Co-Relator{I}.Goal
        = "Challenge")))

THEN Go Concede-Subargument
```

```
E: If CCS.SupportCS NE Nil
Then Choose(1: No-Op

  2: space <- CCS
    Push Generating-Space
    CCS <- Last(CCS.SupportCS)
    CCS.State <- "Active")

Else If CCS.Goal = "Support"
  Then Choose(3: No-Op

    4: space <- CCS
      Push Close-Space
      CCS <- HEAD-CCS
      CCS.State <- "Active"
      HEAD-CCS <- Nil)

If Type-further-Challenge EQ Nil
  Then If CCS.Method
    NE Oneof("Modus-Tollens",
      "Modus-Tollendo-Tollens",
      "Modus-Tollendo-Tollens")
    Then Speaker EXPRESS ("No") ("But")
    Else Speaker EXPRESS
      ("Well") ("Of course") ("But")

CHOOSE ( A: If CCS.Goal = "Support"
  &
  CCS.Contextual-Function.Method NE "Analogy"
  Then
  Push New-Challenge-Epi
  Push Challenge-Support-Specifics

  B: Push New-Challenge-Epi
  Push New-Factor
```

```

C: Push New-Challenge-Epi
Push Range-Application

D: If For Some I,
    CCS.Contextual-Function.Method{I}
    = "New-Factor"
Then
Push New-Challenge-Epi
Push Irrelevant-Factor

E: Push New-Challenge-Epi
Push Deny-Truth

F: If For Some I,
    CCS.Contextual-Function.Method{I}
    = "Analogy"
Then
Analogous-Space <- CCS
Push New-Challenge-Epi
Push Challenge-Analogy-Mappings) )

```

Step 2

```

(For Some I,
(CCSCS
APPEND
(If HEAD-CCS.Goal = "Support"
&
HEAD-CCS.Contextual-Function.Method NE "Analogy"
Then HEAD-CCS.Contextual-Function.Co-Relator{I}
.CounterSupports
Else CCS.Contextual-Function.Co-Relator{I}
.CounterClaims)

S.T. CCS.Contextual-Function.Method{I}
NE "Derived-From" OR "Inference-Of")

(POP)

```

Generating-Space

```

space.State <- "Generating"
space.Focus.High APPEND space.Focus.Medium
space.Focus.High <- Nil
(POP)

```

Close-Space

```

space.State <- "Closed"
space.Focus.Zero <- (space.Focus.Zero, space.Focus.Low,
                      space.Focus.Medium, space.Focus.High)
space.Focus.High <- space.Focus.Medium <- space.Focus.Low <- Nil
(POP)

```

New-Challenge-Epi:

```

rcontextual-function <- [
  co-relator      <- CCS]
  rgoal           <- "Challenge"
  rmode           <- "Explicit"

Push Construct-EPI
nc <- *
Go   Update-Support-Analogy-Challenge

```

Update-Support-Analogy-Challenge:

```

If Analogous-Space NE Nil
Then space <- Analogous-Space
    push Generating-Space
Else (If Re-Enter = True
      Then HEAD-CCS.State <- "Controlling"
      Else space <- HEAD-CCS
          push Generating-Space
  CCS.State <- "Controlling"
  HEAD-CCS <- CCS

CCS <- nc
CCS.State <- "Active"
(POP)

```

Challenge-Analogy-Mappings/Step 1:

Choose
(A: Speaker EXPRESS Propositions A,B

S.T. For Some I,J,
For Some Relation, R{K+1}
A ASSERTS True(Analogous-Space.Mappings.X{I}
R{K+1})

Analogous-Space.Mappings.X{J})

AND
 B Asserts NotTrue(Analogous-Space.Mappings.Y{I}
 R{K+1}
 Analogous-Space.Mappings.Y{J})

S.T.
 True(Analogous-Space.Mappings.Z{I}
 R{K+1}
 Analogous-Space.Mappings.Z{J})

Enable/Cause/Important-To

Analogous-Space.Abstract.Relations{K})

B: Speaker EXPRESS Proposition A

S.T. For Some I,J,K,L

A Predicate Q on Analogous-Space.Mappings.X{J}

S.T.
 Possible(Infer Relation Set, (R{K+1} ... R{K+L}))
 S.T. Q Implies

1. True(R{K+1} ... R{K+L}) In X{Max}
 - &
 2. Not(True(R{K+1} ... R{K+L})) In Y{Max}
- WHERE
 1 & 2 Imply Not(Possible(Analogous.Space.Goal))

Step 2:

```
SETSLOTS(CCS)
Contextual-Function <-- [
  <-- Challenge-Analogy-Mappings]
Claim <-- [
  State-Of-Affairs <-- A,B
  Epistemic-Predicate <-- True]
```

(POP)

Figure 6D:**The Actual Trace**

ENTERING: PRODUCE-NEXT-MOVE/STEP 1

CHOOSING B:

Discourse-Mode = "Discussion" NE "Debate"
THEREFORE going developmental-choice/step 1

ENTERING: DEVELOPMENTAL-CHOICE/STEP 1

CHOOSING A: go start-debate/Step 1

ENTERING: START-DEBATE/Step 1

Discourse-Mode <-- "Debate"
Future-Defender <- B
side{1} <- (B)

CHOOSING A:

[pushing to SHIFT-SPEAKERS

STEP 1:

oldspeaker <-- B
SPEAKER <-- C
Participant-List <-- (B,A,D)

RETURNING TO: START-DEBATE/Step 2

side2 <-- (C)
Sides <-- ((B),(C))
go challenge-choice/step 2

ENTERING: CHALLENGE-CHOICE/STEP 2

C2.Comment = Nil & Expectation = Nil
THEREFORE
Expectation-List <--
((Further-Challenge, C, C2))

Expectation = Nil
& C2.Goal NE "Support"
&C2.Antagonists = Nil

THEREFORE

C2.Antagonists <- (C)
CHOOSING A: pushing to CHALLENGE-DIRECTLY/Step 1

STEP 1:

CHOOSING G:

[Type-Further-Challenge = nil
&
C2.Contextual-Function.Method NE "Modus-Tollens"
THEREFORE

C EXPRESS: "No, but"

C2.SupportCS = Nil & C2.Goal NE "Support"
THEREFORE No-Op

C2.Contextual-Function.Method = "Analogy"
THEREFORE CHOOSING F

[analogous-space <-- C2
pushing to NEW-CHALLENGE-EPI

Step 1:

rcontextual-function <-- [
co-relator <-- C2]
rgoal <-- "Challenge"
rmode <-- "Explicit"
pushing to CONSTRUCT-EPI

ridentifier <-- C3

setslots(c3)

RETURNING TO: NEW-CHALLENGE-EPI
returned register value: * ≈ C3

nc <- C3
going update-support-analogy-challenge

ENTERING: UPDATE-SUPPORT-ANALOGY-CHALLENGE

Analogous-Space = C2 NE Nil
THEREFORE space <- C2
pushing to GENERATING-SPACE

```
C2.State <- "Generating"
C2.Focus.Medium
    <- (Film star, greasy fat millionaire,
        Western Tradition)
C2.Focus.High <- Nil
```

RETURNING TO: UPDATE-SUPPORT-ANALOGY-CHALLENGE

```
CCS <- C3
C3.State <- "Active"
```

RETURNING TO: CHALLENGE-DIRECTLY/STEP 1

pushing to CHALLENGE-ANALOGY-MAPPINGS

STEP 1:

```
*****  
C EXPRESS: "There the woman is selling herself. = A  
In these societies the woman isn't selling  
herself, her parents are selling her." = B  
*****
```

because:

1. For I = 2, J = 4, K = 1,

```
2. Z{2} = object:$woman
    X{2} = film star
    Y{2} = girl
```

```
Z{4} = source:$people
    X{4} = film star
    Y{4} = girl's family
```

Relation, R{K+1} = IDENTITY

```
3. A = "There the woman is selling herself"
    ASSERTS
    True (X{2} R{K+1} X{4})
```

```
3. B = "In these societies the woman isn't selling
    herself, her parents are selling her"
    ASSERTS
    NotTrue(Y{2} R{K+1} Y{4})
```

9. True(Z{2} IDENTITY Z{4}) ENABLES BUY

Step 2:

setslots(c3)

Contextual-Function <- [
Function <- Challenge-Analogy-Mappings]

Claim <- [
State-of-Affairs <- A,B
Epistemic-Predicate <- True]

RETURNING TO: CHALLENGE-DIRECTLY/STEP 2

HEAD-CCS = C1 & C1.Goal NE "Support"
THEREFORE C2.CounterClaim <- (C3)

RETURNING TO: CHALLENGE-CHOICE/STEP 3

Expectation <- [
Function <- Challenge-Choice
Speaker <- B
Context <- C3]

Expectation-List <- ((Challenge-Choice, B, C3),
(Further-Challenge, C, C2))

Expectation <- Nil
go produce-next-move

Bolt Beranek and Newman Inc.

Report No. 4681

7. THE GRAMMAR: CONTEXT SPACE SUSPENSIONS & RESUMPTIONS

The grammar's theoretical analysis of conversational dialogues based on a hierarchical structuring of discourse utterances into a set of formally related context spaces. It is via this organizational schematization that the grammar can explain and model the conversational phenomenon of a subsequent conversational move entailing a resumption of a previously suspended context space.

In this chapter, the grammar's method of processing context space resumptions is presented. Description of the grammar's operational procedures are given via a trace of the grammar's simulated generation of a piece of discourse that serves as a challenge to an opponent's supportive context space generated in an earlier segment of debate. States and arc tests accessed in the grammar's modeling of this piece of discourse are included in Figures 6A,B; a program representation detailing the actions along these arcs are given in Figure 7A; and a trace of the grammar's simulation appears in Figure 7B. The order of presentation in this chapter is the following: Section 7.1, distinguishing between "expected" versus "unexpected" resumptions; Section 7.2, a general description of the grammar's handling of some expected resumptions in debate structures; Section 7.3, a description of the particulars involved in the grammar's simulation of the subargument pop in the excerpt being presented; and Section 7.4, a description of the particulars involved in the grammar's formalization of the substantive challenging remarks given in the excerpt.

7.1 Expected vs unexpected resumptions

A process model of discourse must be able to allow for the resumption of a preceding section of discourse not under current discussion. Some resumptions of this nature can be predicted by a grammar, other resumptions

seem less predictable. In the later class, I would include such conversational moves as returning to a closed context space. When a context space is closed, current discourse is not in terms of it, and we have no specific reason to think it will be returned-to. To resume a closed context space, in fact, a speaker usually prefaces her or his resumption with some explicit indication like, "Getting back to what I told you about X, I should also really tell you, Y." In contrast, for those resumptions that are more predictable, usually no such explicit shifting mechanisms are used, but rather, a speaker will simply say something like, "But anyway, Y." The "Transitional-Utterance" state of the grammar has been developed to accommodate such "unexpected" returns. The more expected types of resumption are facilitated by the grammar's creation of discourse expectations for them.

In this chapter, I present a description of the grammar's handling of one type of expected resumption; namely, the resumption of a context space that has generated some subargument.

7.2 Resumption after a subargument

When a return is made to a generating context space of some subargument, resumption is not limited to literal continuation of the context space being returned to, as it is so limited in resumption of an open context space (i.e., an interrupted context space). Rather, as noted (for example) in discussion of the "Subargument-Concession" conversational move (Chapter 4), such a return may entail giving an additional counterclaim to the claim of the subargument generator context space, or, giving further-support to a previously given counterclaim. Returning from a subargument can be prompted by a conversant's acceptance of defeat in the subargument, or by a team member continuing attack on the higher context space that generated the subargument. M's conversational move in the excerpt below (section of "genetic-environmental" debate) illustrates this latter form of resumption.

Excerpt 16

R: 23. The important thing was that there were two children
24. from the same environment, whereas, only one of the
25. brothers acted that way.
26. So, you couldn't blame it on the child's home.

D: 27. It has nothing to do with the child's home.
28. It has to do with the child's environment.

R: 29. Right, but, the two brothers have the same environment.

D: 30. They do not have the same environment.

R: 31. Why not?

D: 32. Because, you and I are very close in this room right now,
33. but we don't have the same environment.
34. Because, I'm looking at you, I'm seeing that window behind
35. you. You're not seeing that window behind you.
36. You are not looking at you, I am doing it.
37. Two people can't be in exactly the same place at the same
38. time, otherwise they'd occupy the same space.
39. They do not have the same environment.
40. They don't have the same friends.

M: 41. And, I mean, they don't even - You know, to say that
42. two kids come from the same family is really meaningless,
43. because when you think of the difference in treatment
44. that two kids can get in exactly the same family, it's
45. incredible. You know, it's the difference between night
46. and day.

Context Space C6:

Lines 23 - 25, Supporting Context Space of C7.

Context Space C7:

Line 26, Generator of Subargumentation.

Context Spaces C8 - C16:

Subargumentation Context Spaces.

Context Space C17:

Lines 41 - 46, Further-Challenge of C7 via attack on C6.

Corresponding to our two forms of subargument termination (i.e., Case 1: preceding concession of subargument, Case 2: joining forces with a team member), we have different discourse environments preceding the resumptions. Simulation of the different cases are realized by different updating procedures as described below.

7.2.1 Conceding a subargument

After acceptance of an opponent's challenge, a conversant can either end all further debate (i.e., total concession), or s/he can continue the debate by beginning a new subargument in place of the old one. To mention but two forms available for the new subargument: it can be a replacement claim for a claim just conceded, or, if what was conceded as flawed was support of a claim, a conversant may instead salvage the claim by offering some replacement support of it. This latter type of resumption is illustrated below.

Excerpt 17'

- A: 1. I resent that portion of our species that is not female.
B: 2. Why?
A: 3. Because, they're such bastards.
B: 4. They are not.
A: 5. All right, but, you must admit that they're emotionally
6. underdeveloped.

Lines 1 - 5, can be partitioned into the following discourse structure:

- C1: Line 1, Initial claim.
C2: Line 3, Support of claim in C1.
C3: Line 4, Challenge of C1 via attack on C2.
C4: Line 5, Acceptance of C3 and alternative support of C1.

B's challenge of A's warrant (or support) for A's stated attitude towards men is accepted by A. After such acceptance, A can either give up on her initial claim, or she can provide alternative support for it. A chooses the latter option and on Line 5 begins a new supportive context space in which she gives a replacement support for her earlier supportive context space, C2.

A common enough debate move (though not necessarily a desirable one) is the acceptance of an opponent's challenge of one's evidence, followed by a "fixing" of this challenged evidence. A process model of discourse must be able to model such a predictable conversational move. The following steps enable this grammar to do so:

1. Anytime a conversant's position is challenged, the discourse grammar sets up an expectation that this conversant will respond to the challenge with a counter-challenge.
2. Choosing a counter-challenge expectation results in a transition to the challenge organizational state, wherein a finer characterization of the form of challenge to be generated is decided.
3. Subargument concession is one possible subcategorization of a counter-challenge move.
4. In subargument concession, a speaker first concedes the challenge by generating the clue word "All right"/"Okay," and then the speaker can indicate further argumentation with generation of the clue word "but."
5. One mode of further argumentation is to cite replacement support for a flawed previous support.

Conceding a subargument but continuing debate, necessarily entails popping back to one of the context spaces that generated the subargument. Once an argument is conceded as flawed, the context space in which it is contained is no longer directly influential on the succeeding discourse. Additionally, the context space containing the opponent's accepted challenge is also of no further relevance to the discourse: the protagonist of the challenge has no need to further support it, and the antagonist has relinquished the option of counter-challenging it. Instead, a currently non-

active context space, of which the argument conceded is a subargument, becomes directly relevant to continuing discussion. This necessitates updating the discourse model to reflect re-establishment of a relevant discourse context. Specifically, we want to foreclude utterances being interpreted in direct relation to the preceding accepted challenge or flawed argument context spaces.

Discourse register contents and context space "State" value assignments are used to identify a relevant discourse context. Therefore, as illustrated earlier, re-establishment of a relevant discourse context corresponds to updating these discourse constructs. In the case of subargument popping this entails:

- o reassigning to controlling the State value of the resumed generating context space;
- o reassigning the HEAD-CCS register to point to this resumed space;
- o closing the conceded challenge and flawed context spaces;
- o removing any outstanding discourse expectations involving these spaces;
- o creating a new active context space to hold the forthcoming replacement argument;
- o reassigning the CCS register to point to this new space;
- o updating the Domain-Constraints register so that the same "mistakes" are not made again.

In the case of Excerpt 17', for example, by Line 5, CCS is pointing to B's challenge context space, C3, and HEAD-CCS is pointing to A's supportive context space just challenged, C2. By A's acceptance of B's challenge, we know that A's succeeding statements will not be in terms of either of these two context spaces. In fact, as her new context space, C4, contains replacement supportive statements for C1, the HEAD-CCS register should be pointing to C1 by the time the substantive remarks of C4 are generated (and CCS obviously should be pointing to C4). In addition, the State assignments

of both context spaces C2 and C3 should be reassigned to closed, and the discourse expectation that A will further-challenge B's challenge should be deleted from the Expectation-List register. These last two actions reflect that context spaces C2 and C3 play no further role in the succeeding discourse (unless they are explicitly re-entered). Also, we need to add onto the Domain-Constraints register the accepted proposition that not all of the non-female portion of the human population are bastards.

When a speaker simultaneously concedes a subargument and indicates continued argumentation (i.e., by the generation of such clue words as, "All right"/"Okay", "but"), we can immediately close the current active context space containing the opponent's accepted challenge. (Thus, right after A's saying, "All right, but," context space C3 receives a closed state assignment.) In addition, if the just closed context space is a supportive space, then, the context space that it supports, being pointed-to by the HEAD-CCS register⁶⁴, can be closed at this point as well. This reflects that one's acceptance of an opponent's supportive statements entails acceptance of the claim being supported as well.

We also will want to close the conceding conversant's flawed context space and reinstantiate as controlling the context space being resumed. However, some further analysis of this flawed space is needed to identify that context space most likely being returned to. In particular, we have different likelihoods as to which preceding space will be reinstated based on whether the flawed space is a supportive or issue context space. The two situations are individually discussed below.

⁶⁴During argumentation, HEAD-CCS either points to a supportive context space being challenged, an issue space being challenged, or to a counterclaim/countersupport issue space support of which has just been given. In the two former cases, the speaker's flawed space is pointed to by HEAD-CCS. In the latter case, a Co-Relator of the HEAD-CCS space is the speaker's flawed space.

7.2.1.1 Flawed supportive context space

Excerpt 17' above, illustrates a conversant's acceptance of a challenge to a supportive context space. After such concession, a conversant has one of two options: (1) salvage the claim meant to be supported by offering alternative support for it, or (2) concede the invalidity of the claim as well. The latter of these two alternatives reduces to our second case of subargument concession (i.e., a conversant giving up on an issue context space) and is described in Section 7.2.1.2

The first of these two alternatives corresponds to the alternative chosen by A in Excerpt 17'. The grammar's handling of such a situation is quite simple:

- o the rejected supportive space is reinstated as the active context space with CCS pointing to it;
- o HEAD-CCS is set to point to the rejected space's controlling context space (i.e., the context space containing the claim this space was to support);
- o the Type-Further-Challenge register is set to "Support;"
- o transition to the "Further-Challenge-Support/Step 3" state of the grammar which will characterize some aspects of the forthcoming replacement support.

The Further-Challenge-Support/Step 3 state is an organizational state which is reached in the following situations:

1. Multiple supports, given in succession, to a single preceding issue space.
2. Replacement of an immediately preceding flawed supportive context space.
3. Subargument replacement where some extensive discourse popping has previously been performed.

For the first two cases⁶⁵ a "carry over" of some components of the immediately preceding supportive space is facilitated(e.g., reliance on a same authority for the subsequent support). After setting registers to denote any such carry-over, actions are executed which result in the closing of the last supportive space given, and a reinstatement of the issue space to be further supported as the active context space in the discourse model. Control then passes to the "Support-Choice/Step 2" state which expects such a configuration. This state will create a new supportive context space, and will begin to subcategorize the forthcoming support move.

7.2.1.2 Rejected issue context space

Sometimes a conversant is forced to concede as flawed not only a particular support of a claim but a claim in its entirety (or comparably, sometimes the speaker may just feel the claim not worth further defending). Let's call the space in which such a claim lies debative-issue space C3⁶⁶. Now, given that a conversant concedes as invalid the claim of a debative-issue context space and yet continues to debate (as reflected by the conversant's use of the clue word "but" after the concession), this issue space, C3, must itself have been developed in challenge to an opponent's preceding debative-issue context space (i.e., the flawed issue space, C3, fills the CounterClaims/CounterSupports slot of this preceding debative-issue context space; let's call this preceding space, C2).

As the current speaker has just accepted that her or his own argument in

⁶⁵The third situation is more fully described in the sections to follow.

⁶⁶A debative-issue context space is one that has a "CounterClaims" and a "CounterSupports" slot. The space referred to here, being called C3, has such slots, with the challenge just accepted being a filler of one of these two slots.

C3, against the opponent's argument in C2, is invalid, the speaker can now either offer an alternative argument against C2 (i.e., not yet concede the validity of C2), or, if C2 was developed in challenge of a preceding debative-issue context space, C1, (developed by the speaker or a team member), the speaker can instead yield on C2 as well, and pop back even higher in the debate structure to "fix-up" her/his side's earlier argument in C1. At this point, in fact, the conversant can pop as high up in the debate structure as s/he wishes, either giving alternative support (if appropriate) for one of her own preceding claims that is currently in jeopardy (as s/he has lost a subargument generating from it), or giving a new counterclaim or countersupport in its place⁶⁷.

The grammar's basic handling of any of the options cited above (i.e., the current speaker's next move of offering some replacement counterclaim/countersupport for a previously given counterclaim/countersupport, or offering alternative support for one of these preceding claims) rests upon an identical mechanism:

- o using a yet unfulfilled discourse expectation that the conceding conversant (or team member) will further-challenge a context space against which s/he or a team member earlier argued (at the grammar's highest level of abstraction, it treats replacement supports as further-challenges).

At this point, then, the grammar simply chooses such a discourse expectation from its Expectation-List register, and it passes control to "Expectation.Function" which is the "Further-Challenge" state in the discourse grammar⁶⁸.

⁶⁷All claims of the opposition, bypassed on the way up the context space network to the claim to be salvaged, are considered implicitly accepted by the speaker's side.

⁶⁸Control is actually passed to Step 3 of this routine.

First steps of this routine responsible for one's "subargument fixing"⁶⁹ are to perform a further analysis of the context space to be further challenged in order to establish whether a replacement support for one of its counterclaims or countersupports is warranted, or whether the only option available at this point is a replacement counterclaim or countersupport. Based on its choice of possibilities, the routine sets the Type-Further-Challenge register, and updates the discourse model to reflect the closing of all intervening subargumentation.

The Further-Challenge state is able to re-establish the space being popped back to as the forthcoming relevant discourse context by traversing the Co-Relator links of spaces from the current active space to the one pointed to in the discourse expectation being processed. This network traversal, however, does not include traversing the links of closed context spaces. This reflects the fact that closed context spaces (and those to which they point) are deemed irrelevant to all current discourse processing.

By the time the Concede-Subargument routine is ready to pass control to Further-Challenge, CCS points to a closed context space, i.e., the space containing the opponent's accepted challenge. Before passing control and initiating the traversal walk, the grammar must therefore first reassign CCS to a non closed context space: it chooses the context space containing the speaker's conceded flawed claim⁷⁰.

⁶⁹This same routine is also responsible for plain further-challenges that do not entail fixing of one's subargument, cf., Section 7.3. Many same procedures, however, are applicable to the two situations, though, they differ in two respects: 1. in the later case if a support option is chosen, it is thought of as "further-support" rather than "replacement-support," and 2. intervening implicit concessions are noted on the Domain-Constraints register only in the case of preceding concession.

⁷⁰Recall that since further testing was appropriate to distinguish between flawed issue and supportive spaces, this space has not yet been closed.

7.2.1.3 Common handling aspects between the two cases

Notice that the grammar is able to model both forms of argument concession by (1) partitioning a discourse into a hierarchy of distinct, but related and linked context spaces; (2) keeping track of the effects of preceding moves in its discourse model, which includes discourse expectation construction; and (3) preparing for generation of forthcoming utterances by noting the discourse effects of the forthcoming move via sensitivity to clue word signals and different subcategory possibilities for the move.

Also notice that the tests and actions that the grammar performs in production of discourse, can analogously be used by listeners, and the grammar in interpretive mode. That is, both in interpretation and generation we:

- o set up expectations of conversational move categories most likely to follow preceding conversational development;
- o use our knowledge of clue words, and the standardized effects of conversational moves, to update our discourse models in preparation for the interpretation of subsequent moves.

For example, a conversant knowing that s/he has just challenged an opponent's support of a claim, presumably is quite prepared for the opponent to reply to this challenge with either a counter-challenge or concession; each of which is usually differentiatedly signalled by the clue words prefacing the opponent's response ("But" and "All right, but," respectively).

At this point, let's turn our attention to the situation where we have a resumption in the argument structure due to a team member joining forces with a speaker currently engaging in debate against an opponent. Since in this case we have no preceding concession, we will clearly have very different aspects of the discourse model to consider, analyze, and update.

7.2.2 Joining forces

Sometimes we get a return from subargumentation by the further-

challenging of a context space that generated the subargument without intervening attack by an opponent or concession of such by the current speaker. This usually happens when a team member chimes in with an additional challenge to the initial claim which has been generating current subargumentation. M's move on Line 41, Excerpt 16, for example, entails such a return. Detailed explanation of the options available, and mechanisms used, to process this form of conversational development are given via direct description of the grammar's simulation of this move.

7.3 Example: Trace of pop in Excerpt 16

M's utterances in Excerpt 16 do not directly further support D's preceding claim ("The two brothers do not have the same environment") nor do they further support his supportive utterances ("They don't have the same friends"). Rather, M's utterances serve as a direct further-challenge to R's claim that a child's home is not to blame for a child's aggressive behavior.⁷¹ M's challenge, as described in Chapter 4, is via attack on R's support of her claim; formally speaking, the challenge attacks R's mapping of "two twins living at home" onto "two people sharing a same environment."

In order to model the specifics of this challenge, the relevant discourse context by point of generation should consist of: 1: a new challenge context space into which M's challenging remarks can be placed; and 2: R's support context space (C6) containing these mappings. Currently, however, the relevant discourse context is composed of D's debative-issue context space containing his preceding claim (C10), and its supportive context space (C16). Some discourse model updating is necessitated.

⁷¹D's earlier utterances, "It has nothing to do with the child's home. It has to do with the child's environment," is the initial challenge to R's claim.

As the grammar's discourse model indicates that a debate is in process, with D on the attack providing support for a challenge claim, the grammar knows that it has a number of outstanding further-challenge discourse expectations for D (or other members of his team) against the opposing team's preceding arguments.

To model M's conversational move, the grammar chooses to fulfill such a discourse expectation as its next conversational move. As challenging an issue space's support, is equivalent to challenging the issue space itself, all challenge expectations cite issue spaces to be challenged. As its next conversational move, therefore, the grammar chooses to process (Further-Challenge, D, C7), whose SupportCS slot points to C6, the space about to be attacked. This discourse expectation was created when D, on Line 27, first challenged C7. Having chosen such an expectation, the grammar passes control to the state which is responsible for handling further-challenges, Further-Challenge/Step 1.

Further-Challenge/Step 1: The grammar's first action in processing a further-challenge is to select a next speaker. All options available to initial challenges are available here as well. Namely, the grammar can choose as next speaker:

- o the expected speaker (who may be the current speaker);
- o a known team member of the expected speaker (who may be the current speaker);
- o a yet unaligned conversant;
- o a switching side conversant.

Modeling Excerpt 16, the grammar chooses M, a known team member of D, as next speaker.

Further-Challenge/Step 2: Returning from its push to Shift-Speaker-Sameside, with a new speaker in hand, the grammar can now generate the clue word(s) corresponding to this conversational move, i.e., "And"/"And, furthermore," or the like. In the case of Excerpt 16, M just generates the clue word, "And."

Further-Challenge/Step 3: As noted earlier⁷², this state is responsible for discourse resumptions incurred by further challenges and subargument concessions; it results in a re-establishment of the relevant discourse context for subsequent processing. As described, context re-establishment in these cases entails closing all intervening subargumentation context spaces, and deleting all outstanding discourse expectations involving these spaces. This state's first action is to push to a constructive state of the grammar where such updating is performed.

Find&DeleteExpectation-Irrelevant-Contexts/Step 1: This state recursively calls on itself, on each pass:

- o adding the next intervening subargument context space onto an "Intervening-Subarguments" list;
- o deleting from the Expectation-List any outstanding expectations involving this space;
- o retrieving the next intervening subargument to be closed by following the Co-Relator links of the context space just added to the list.

This network traversal begins with the active context space and ends when the only spaces retrieved for readjustment are (1) context spaces already closed; (2) context spaces already on the Intervening-Subarguments List; or (3) the context space named in Expectation.Context.

Major features of the grammar's context space configuration by M's move (of relevance here) are:

- o C6: Line 23 - 25 - "... only one of the brothers acted that way;" Goal: Support; Method: Modus-Tollendo-Tollens*; Co-Relator: C7; State: Closed.
- o C7: Line 26 - "... not blame the child's aggressive behavior on the

⁷²When the "claim concession" option is taken in the Subargument-Concession routine and a Further-Challenge expectation is chosen, it is to this state of the grammar that control passes.

child's home;" Goal: Fix-Claim; Method: Constraintment; Co-Relator: C3; SupportCS: C6; CounterClaims: C8; State: Generating.

- o C8: Line 27 - 28 - "... nothing to do with home ... child's environment;" Goal: Challenge; Method: Irrelevance-By-Expansion; Co-Relator: C7; CounterClaims: C9 State: Generating.
- o C9: Line 29 - "... brothers same environment;" Goal: Challenge; Method{1}: Apply-Expansion; Co-Relator{1}: C8; Method{2}: Derived-From; Co-Relator{2}: C6; CounterClaims: C10; State: Generating.
- o C10: Lines 30, 39 - "They do not have the same environment;" Goal: Challenge; Method: Deny-Truth; Co-Relator: C9; SupportCS: (C11, C16) State: Controlling.
- o C11: Lines 32 - 33 - "You and I ... not same environment;" Goal: Support; Method: Analogy; Co-Relator: C10; SupportCS: (C12, C13); State: Closed.
- o C12: Lines 34-35 - "I am seeing window ... you're not;" Goal: Support; Method: Modus-Tollendo-Tollens; Co-Relator: C11; State: Closed.
- o C13 Line 36 - "You are not looking at you ...;" Goal: Support; Method: Modus-Tollendo-Tollens; Co-Relator: C11; State: Closed
- o C14: Line 37 - "Two people can't be same place ...;" Goal: Relate-Analogy; Method: Abstraction; Co-Relator: C10; SupportCS: C15; State: Closed.
- o C15: Line 38 - "... otherwise same space;" Goal: Support; Method: Modus-Tollens; Co-Relator: C14; State: Closed.
- o C16: Line 40 - "They don't have the same friends;" Goal: Support; Function: Modus-Tollens; Co-Relator: C10; State: Active

Beginning with the active context space, C16, the grammar appends it and context spaces C10, C9, and C8, onto its Intervening-Subarguments list. Intervening discussion contained in context spaces C15, C14, C13, C12, and C11, are not accessed in this traversal. This correctly reflects the influence of closed context spaces: they are entirely irrelevant to subsequent discourse processing (unless they are explicitly re-entered).

Notice that the grammar's structuring and linking mechanism of partitioning discourse utterances into a hierarchical network of context

spaces with varying influential roles in a discourse, enables it to not only identify and establish a relevant discourse context for subsequent engagement, but in addition, it provides the grammar with a mechanism with which to mark and hence ignore all preceding sections of discourse that need not be considered in such a re-establishment.

Further-Challenge/Step 4: Having noted all relevant subargumentation, the grammar now assigns the Protagonist of the context space about to be further challenged the role of Future-Defender. In this case, R, the Protagonist of C7, is assigned this role. The grammar then begins its finer characterization of the form of challenge to be generated. As noted earlier, two subcategorizations are possible: (1) new counterclaim/countersupport specification; or (2) further support of a preceding counterclaim/countersupport. M, on the offense, not having having to bolster a perhaps weakly supported argument, chooses the former.

Preparing the discourse model for a new counterclaim/countersupport option of a further challenge move is quite simple:

- o CCS is reset to the issue context space about to be further-challenged (i.e., Expectation.Context; here, C7);
- o Type-Further-Challenge is set to "Challenge;"
- o all spaces noted on the Intervening-Subarguments list are closed.

The further-support option of a further-challenge is slightly more complex. It is only viable if current subargumentation stems from one's support of a preceding counterclaim or countersupport. If subargumentation, instead, stems from a preceding unsupported counterclaim or countersupport, one cannot simply return to this preceding claim and suddenly support it. This is because support moves are only appropriate when there is a clear identifiable claim to be supported. Since intervening subargumentation stems from a previously unsupported claim, it is clear that providing support for the claim is not at issue or expected. To begin support of such a claim, one must first explicitly re-establish the claim as the relevant discourse

context, thereby, setting up a context wherein support is warranted and expected.

On the other hand, if current subargumentation does stem from support of a counter-argument, then, of course, support of this preceding claim is at issue and of direct relevance to current subargumentation. In this case, then, the resumption can entail an immediate citation of replacement/further support for this preceding argument.

Correspondingly, the grammars actions along this choice path are subject to certain criteria of acceptability which are listed alongside the actions to be performed.

- o HEAD-CCS is set to one of the counterclaims or countersupports of the space resumed, which has been involved in the current subargumentation (i.e., it is a space noted on the Intervening-Subarguments list)
- o This chosen context space is assigned a controlling state;
- o CCS is set to a preceding support of the chosen counterclaim or countersupport space;
- o Type-Further-Challenge is set to "Support;"
- o Deleting these two spaces from the "Intervening-Subarguments" list.

Further-Challenge/Step 5: Having established which context spaces of the intervening subargument are to be suspended/terminated by the resumption (i.e., those remaining on the Intervening-Subarguments list), the grammar now closes these spaces to reflect that they are irrelevant to further argumentation (i.e., their State slots are set to "closed," and their focus level assignments are set to zero). In addition, for the case of preceding concession, all claims of the opposition noted in these spaces are appended onto the Domain-Constraints register to reflect their implicit acceptance by the current speaker's side. Control is then passed to the Further-Challenge-Support/Step 3 state of the grammar, where, depending on the value of the Type-Further-Challenge register, control is either passed to a support or challenge organizational state in the grammar.

Further-Challenge-Support/Step 3: In the case of Line 41, Excerpt 16, Type-Further-Challenge equals "Challenge" and control passes to the grammar's challenge organizational state, Challenge-Choice/Step 2, wherein a subcategorization of the further-challenge form is made. In the main, subsequent processing is identical to that for initial challenges, as illustrated in the subsequent section.

7.4 Example: Trace of challenge in Excerpt 16

Some of the routines accessed in this trace have already been described in Chapter 6; where this is the case, only the particulars for the case at hand are mentioned.

Challenge-Choice/Step 2: As described in Chapter 6, the grammar's first action in this state is to create the expectation, if warranted, that the current speaker may at some future point further-challenge the future defender's argument. Since the expectation being processed is one of a further-challenge, the preceding conversational move was by a team member. Thus, the current speaker is neither responding to a demand-support-claim, or to a demand-support-rejection (i.e., Expectation.Associated-Constraints could not equal "Supply-Support-Rejection" or "Supply-Support-Claim"). Nor could the speaker be responding to an unsubstantiated flat dismissal (i.e., CCS.Comment.Contextual-Function.Method NE "Flat-Rejection"⁷³). Therefore, a further challenge is appropriate and the grammar appends (Further-Challenge, M, C7) onto its list of outstanding discourse expectations.

As the challenge is not in response to a support demand, and this is M's first challenge against C7, the grammar appends M onto C7's list of

⁷³Since a further challenge entails subargument popping, any previously cited flat dismissal must have been replaced by a substantive challenge in order for it to have been a cause of intervening subargumentation.

antagonists. Simulating M's choice of attack, the grammar then chooses the direct form of challenge.

Challenge-Directly/Step 1: As explained in Chapter 6, there are three major conceptual subcategorizations of a direct challenge move: (1) argument concession; (2) emotive/questioning challenges; and (3) substantive challenges. M on Line 41 chooses the latter (i.e., Choice E in this state). As explained, the grammar's first action along the substantive challenge transition is to decide whether to challenge an opponent's claim or support of such; and, in conjunction, if necessary, to perform some minor discourse model updating actions. As M's choice of attack against R's issue space (C7), is via attack on its supportive space (C6), the support-challenge option is chosen by the grammar. Since, the active space is not this supportive space, but rather is the issue space supported, the grammar reassigned this issue space a generating state (with appropriate re-setting of focus level assignments), and it reinstates the supportive context space C6 as the active context space in its discourse model (with no change in focus level assignments). As the Type-Further-Challenge register is set, the grammar does not cause generation of any additional clue words to "And" already generated.

At this point, the grammar must choose a subcategory of challenge to be used against the support. Modeling M's move, it chooses Choice E/A, the Challenge-Support-Specifics type of challenge, wherein specifics of a supportive context space, such as a principle and an authority of support, are challenged.

As M's move entails a substantive challenge, the grammar first constructs a new active challenge issue context space to contain the substantive challenging remarks about to be generated, before it passes control to the Challenge-Support-Specifics state. A constructive state, called for all subchoice paths of Choice E is now called, wherein a new context space, C17, is created with the following initial slot assignments: (1) Goal: "Challenge;" (2) State: "Active;" Co-Relator: C6. In addition, context space C6, the space about to be challenged is reassigned a controlling state, HEAD-CCS is set to point to it, and CCS is set to the new space C17. The grammar

then passes control to the subcategory organizational state chosen for this move.

Challenge-Support-Specifics: The grammar distinguishes between two main subcategories of a support-specific challenge: challenging an authority of support; challenging a principle of support. As M's challenge rests on challenging R's use of a generic principle of support, the grammar passes control to its Challenge-Basis-Support state which is responsible for challenges of this form.

Challenge-Basis-Support There are different means of challenging a debator's reliance on some generic principle of support. Three of these, captured by Choices A-C in this state, are:

1. challenge of the applicability of the principle to the case at hand;
2. challenge of the scope of the principle in general;
3. total denial of the truth of the principle per se.

M, in her challenge on Lines 41 - 46, chooses the first form of principle-challenge, and hence control is now passed to the "Challenge-Mappings" state of the grammar.

Challenge-Mappings/Step 1: Explication of M's challenge, rests in recognizing certain presuppositions underlying R's presumed generic principle of support, and the non-carryover of these presuppositions in its current instance of use. As discussed in some detail in Section 4.1.8, R's principle of support rests on the "If-Then" principle of two people sharing a same environment manifesting complementary social behaviors. In using this principle of support, R maps "two people sharing a same environment" onto "two twins sharing a same home." M's challenge rests in challenging this mapping. A presupposition of two people sharing a same environment is that the environment treats the two people identically; two kids in a same home are usually not treated identically. Hence, the inapplicability of the mapping and use of the principle for the case at hand.

Challenge-Mappings/Step 2: At this point, the grammar appends onto the

active space the substantive remarks just made. It then returns control to its caller, Challenge-Directly/Step 1, where it performs some additional updating actions common to all forms of direct substantive challenges.

Challenge-Directly/Step 2: All direct substantive challenge states return control to the Challenge-Directly/Step 2 state of the grammar. In this state, the challenge space just completed is appended onto the challenged issue space's CounterClaim or CounterSupport slot. As HEAD-CCS points to C6 whose Goal is "Support," the grammar appends C17, the new challenge space, onto the CounterSupports slot of the issue space that C6 supports, i.e., C7. Control is then returned to Challenge-Choice/Step 3, the reemerging state for all forms of challenges.

Challenge-Choice/Step 3: Having generated the challenge, in whatever form, the grammar now constructs and appends onto the Expectation-List register the expectation that the conversant earlier assigned the Future-Defender role (here, R) will counterchallenge the challenge just given (here, C17). The Type-Further-Challenge register is then reset to Nil and control is returned to the grammar's start state, wherein processing of the next conversational move is commenced.

7.5 Conclusions

A main focus of this chapter has been to illustrate the grammar's use of outstanding discourse expectations and functional partitioning of a discourse, in order to model discourse resumptions.

A discourse resumption entails re-establishment of a relevant discourse context, which involves closing all intervening discussion from a current point discussion up to the point of return. I have illustrated that the grammar's linking mechanism of context spaces and its differentiation between various influential discourse roles that context spaces play, enables it to both re-establish a current relevant discourse context, and to ignore all intervening discussion not relevant to this re-establishment.

Discussion in this chapter has also illustrated how the grammar uses registers and context space values set on earlier cycles through the grammar, and on earlier transitions within a given cycle, to keep track of earlier decisions and moves taken in order to ensure that its subsequent discourse generation moves are maxim-abiding. I have illustrated the grammar's conceptual breakdown of a move into component parts, which enables it to handle by one and the same mechanism such diverse moves as conceding a subargument and further challenging an opponent.

Figure 7A**The Grammar**

Produce-Next-Move:
See Figure 6C.

Further-Challenge/Step 1:

Choose (A: Push Shift-Speaker-Expectation
B: knownside <- Expectation.Speaker
push Shift-Speaker-Sameside/Step 1)

Step 2:

Speaker EXPRESS "And, furthermore" / "And" / etc.

Step 3:

irrelevant-context <- CCS
Push Find&DeleteExpectations-Irrelevant-Contexts/Step 1

Step 4:

Future-Defender <- Oneof(Expectation.Context.Protagonists)

Choose
(A: If For Some I,J
 (Expectation.Context.CounterClaims{I}
 OR
 Expectation.Context.CounterSupports{I})
 MEMBER
 Intervening-Subarguments
 &
 Expectation.Context.CounterClaims/CounterSupports{I}
 .SupportCS{J}

NE Nil

Then HEAD-CCS <- Expectation.Context
 .CounterClaims/CounterSupports{I}

Expectation.Context
 .CounterClaims/CounterSupports{I}.State
 <- "Controlling"

CCS <- Expectation.Context
 .CounterClaims/CounterSupports{I}

.SupportCS{J}

```
HEAD-CCS DELETE Intervening-Subarguments
CCS DELETE Intervening-Subarguments
Type-Further-Challenge <- "Support"
```

```
B: CCS <- Expectation.Context
CCS.State <- "Active"
Type-Further-Challenge <- "Challenge")
```

Step 5:

```
REPEAT space <- Next-Of(Intervening-Subarguments)
Push Close-Space
UNTIL space = Nil
```

```
If Update-Constraints NE Nil
THEN Push Implicit-Concessions
Intervening-Subarguments <- Nil
Go Further-Challenge-Support/Step 3
```

Shift-Speaker-Expectation:

```
If Expectation.Speaker NE Speaker
Then Speaker APPEND Participant-List
Speaker <- Expectation.Speaker
Speaker DELETE Participant-List
(POP)
```

Shift-Speaker-Sameside/Step 1:

```
For Some I,
Current-Side <- Side{I} S.T. knownside MEMBER Side{I}
```

```
If Current-Side NE (knownside)
Then Choose(A: Go Step 2
```

```
B: Speaker <- Oneof(Current-Side)
S.T. Speaker NE knownside
Speaker DELETE Participant-List
knownside APPEND Participant-List
(POP) )
```

Step 2:

```
Sides APPEND Oldsides
```

Speaker <- Choosed(Participant-List)
S.T. Speaker NE knownside
&
Not(Speaker MEMBER Current-Side)

Speaker APPEND Side{I}(Sides)
knownside APPEND Participant-List

If For Some J NE I,
Speaker MEMBER Side{J}(Sides)
Then Speaker DELETE Side{J}(Sides)

(POP)

Find&Delete-Expectations-Irrelevant-Contexts/Step 1

Delete All Expectations of Expectation.List with
Context = irrelevant-context
irrelevant-context APPEND Intervening-Subarguments
irrelevant-contexts-list
<- irrelevant-context.Contextual-Function.Co-Relators

Step2:

irrelevant-context <- Choosed(irrelevant-contexts-list)
If irrelevant-context = Nil
Then (POP)
If irrelevant-context NE Expectation.Context
&
irrelevant-context.State
NE "Closed" OR "Superceded"
&
Not(irrelevant-context MEMBER Intervening-Subargument)
Then Push Close&Delete-Expectations-Irrelevant-Contexts
Go Step 2
Else Go Step 2

Close-Space
See Figure 6C.

Generating-Space
See Figure 6C.

Further-Challenge-Support/Step 1:

Choose (A: knownside <- Speaker
push Shift-Speaker-Sameside

B: Go Step 2)

Step 2:

Speaker EXPRESS "And"/"And, furthermore"/etc.

Step 3:

If Type-Further-Challenge = "Support"
Then Choose(A: Same-Principle <- True

B: If CCS.Authority NE Nil
The Same-Authority <- True

C: If CCS.Authority NE Nil
Then Same-Authority <- True
Same-Principle <- True

D: Same-Principle <- Nil
Same-Authority <- Nil)

CCS.State <- "Closed"
CCS <- HEAD-CCS
Go Support-Choice/Step 2

Else Go Challenge-Choice/Step 2

Challenge-Choice/Step 2:

See Figure 6C.

Challenge-Directly/Step 1:
See Figure 6C.

Challenge-Support-Specifics:

Choose(A: Go Challenge-Basis-Support
B: Go Challenge-Authority)

Challenge-Basis-Support:

Choose(A: Go Challenge-Mappings/Step 1
B: Go Challenge-Scope/Step 1
C: Go Challenge-Validity/Step 1)

Challenge-Mappings:

Speaker EXPRESS some Proposition, P

S.T. For Some SA2 [Possible(Infer(Implication(P) = SA2))
OR
Let SA2 = P]

S.T. For Some I, For Some PR(I)
[SA2 DENY True(PR(HEAD-CCS.MAPPINGS.X{I}))
WHERE
(True(PR(HEAD-CCS.MAPPINGS.Y{I}))
Presupposition-Of
HEAD-CCS.Support-Principle)

Step 2:

Setslots(CCS)
Contextual-Function <- [
Method <- "Challenge-Mappings"]
Claim <- Epistemic-Claim(P)

(POP)

Figure 7B

Actual Trace Lines 41 - 46, Excerpt 16

ENTERING: Produce-Next-Move/Step 1

CHOOSING A:

Expectation-List NE Nil THEREFORE
Choosing Expectation <-- (Further-Challenge, D, C7)

ENTERING: Further-Challenge/Step 1

CHOOSING B:

[knownside <-- D
pushing to Shift-Speaker-Sameside/Step 1

current-side <-- (D,M)

current-side NE (D)

THEREFORE CHOOSING B:

[SPEAKER <-- M

Participant-List <-- (R,J)

Participant-List <-- (D,R,J)]

RETURNING TO: Further-Challenge/Step 1

STEP 2:

M EXPRESS: "And"

Step 3:

irrelevant-context <- C16

pushing to Find&DeleteExpectations-Irrelevant-Contexts/Step 1

no expectations on expectation-list with context = C16

Intervening-Subarguments <- (C16)

irrelevant-context-list <- (C10)

Step 2:

irrelevant-context <- C10

irrelevant-context-list <- Nil

irrelevant-context NE Nil

C10 NE C7

& C10. State = "Controlling" NE "Closed"/"Superceded"
& Not(C10 Member (C16))
THEREFORE pushing to
Find&DeleteExpectations-Irrelevant-Contexts/Step 1

DELETING (further-challenge, R, C10)
From Expectation-List
Intervening-Subarguments <- (C10, C16)
irrelevant-context-list <-> (C9)

Step 2:

irrelevant-context <-> C9
irrelevant-context-list <-> nil
irrelevant-context NE Nil
C9 NE C7
& C9.State = "Generating" NE "Closed"/"Superceded"
& Not(C9 Member (C10, C16))
THEREFORE pushing to
Close&DeleteExpectations-Irrelevant-Contexts/Step 1

DELETING (further-challenge, D, C9)
From Expectation-List
Intervening-Subarguments <- (C9, C10, C16)
irrelevant-context-list <-> (C8, C6)

Step 2:

irrelevant-context <-> C8
irrelevant-context-list <-> (C6)
irrelevant-context NE Nil
C8 NE C7
& C8.State = "Generating" NE "Closed"/"Superceded"
THEREFORE pushing to
Close&DeleteExpectations-Irrelevant-Contexts/Step 1

DELETING (further-challenge, R, C8)
From Expectation-List
Intervening-Subarguments <- (C8, C9, C10, C16)
irrelevant-context-list <-> (C7)

Step 2:

irrelevant-context <-> C7
irrelevant-context-list <-> nil
irrelevant-context NE Nil
C7 = C7 THEREFORE going step 2

STEP 2:

irrelevant-context <-- nil
irrelevant-context = Nil THEREFORE (POP)

RETURNING TO:

Close&DeleteExpectations-Irrelevant-Contexts/Step 2
go step 2

STEP 2:

irrelevant-context <-- C6
irrelevant-context-list <-- nil
irrelevant-context NE Nil
C6 NE C7
&
C6.State = "Closed"
THEREFORE going step 2

STEP 2:

irrelevant-context <-- nil
irrelevant-context = nil
THEREFORE (POP)

RETURNING TO:

Close&DeleteExpectations-Irrelevant-Contexts/Step 2
go step 2

STEP 2:

irrelevant-context <-- nil
irrelevant-context = nil
THEREFORE (POP)

RETURNING TO:

Close&DeleteExpectations-Irrelevant-Contexts/Step 2
go step 2

STEP 2:

irrelevant-context <-- nil
irrelevant-context = nil
THEREFORE (POP)

RETURNING TO: Further-Challenge/Step 3

Step 4:

Future-Defender <- R

Choosing B:

[CCS <-- C7

C7.State <- "Active"
Type-Further-Challenge <- "Challenge"]

Step 5:

space <- C8
pushing to Close-Space

C8.State <- "Closed"
C8.Focus.Zero <- (C8.Focus.Zero, C8.Focus.Medium,
 C8.Focus.Low, C8.Focus.High)
C8.Focus.High <- C8.Focus.Medium <- C8.Focus.Low <- Nil
....
C16.State <- "Closed"
C16.Focus.Zero <- (C16.Focus.Zero, C16.Focus.Medium,
 C16.Focus.Low, C16.Focus.High)
C16.Focus.High <- C16.Focus.Medium <- C16.Focus.Low <- Nil

RETURNING TO: Further-Challenge/Step 5

Update-Constraints = Nil
Intervening-Subarguments <- Nil
go further-challenge-support/step 3

ENTERING: Further-Challenge-Support/Step 3

Type-Further-Challenge = "Challenge"
THEREFORE go Challenge-Choice/Step 2

ENTERING: Challenge-Choice/Step 2

C7.Comment = Nil
&
Expectation.Associated-Constraints = nil
THEREFORE Expectation-List
 <- ((Further-Challenge, M, C7), ...)
Expectation.Associated-Constraints = nil
&
(C7.Goal NE "Support" & Not(M Member C7.Antagonists))
THEREFORE
C7.Antagonists <- (M, D)
CHOOSING A: pushing to Challenge-Directly/Step 1

CHOOSING E:
C7.SupportCS = C6 NE Nil
THEREFORE CHOOSING 2:
[space <- C7
pushing to Generating-Space

```
C7.state <- "Generating"
C7.Focus.Medium <- (C7.Focus.Medium,
                     C7.Focus.High)
C7.Focus.High <- Nil
```

RETURNING TO: Challenge-Directly/Step 1 (Choice E)

```
CCS <- C6
C6.State <- "Active"]
```

Type-Further-Challenge = "Challenge" NE Nil

```
C6.Goal = "Support"
& C6.Method = "Modus-Tollendo-Tollens" NE "Analogy"
THEREFORE CHOOSING A:
pushing to New-Challenge-EPI
```

```
rcontextual-function <- [
  co-relator           <- C6]
  rgoal <- "Challenge"
  rmode <- "Explicit"
  pushing to Construct-EPI
```

```
ridentifier <- C17
setslots(C17)
```

RETURNING TO: New-Challenge-EPI
returned register value: * = C17

```
nc <- C17
going Update-Support-Analogy-Challenge
```

```
analogous-space = Nil & Re-enter = Nil
THEREFORE
[space <- C?
  pushing to Generating-Space
```

RETURNING TO: Update-Support-Analogy-Challenge
C6.State <- "Controlling"
HEAD-CCS <- C6]

```
CCS <- C17
CCS.State <- "Active"
```

RETURNING TO: Challenge-Directly/Step 1 (Choice E/A)

pushing to: Challenge-Support-Specifics

Choosing A: go challenge-basis-support

ENTERING: CHALLENGE-BASIS-SUPPORT

Choosing A: go challenge-mappings/step 1

ENTERING: CHALLENGE-MAPPINGS/STEP 1

M EXPRESS: "You know, to say that two kids come from
the same family is really meaningless,
= P because when you think of the difference
in treatment that two kids can get in
exactly the same family, it's incredible.
You know, it's the difference between night
and day."

because:

1. P = SA2
2. P1 = "treated same way"
X1 = "two twins living in same home"
3. SA2
DENY
True(treated same way(two twins living in same home))
4. Y1 = "two people sharing same environment"
5. Necessary(True
(treated same way(two people sharing same environment))
for

True(

IF

One's social interactive behavior is influenced by
one's environment before (&during) kindergarten

THEN

Two people sharing this same environment will
manifest the same social interactive behavior)

STEP 2:

NOTE: Add additional slot values to ccs.

```
setslotsC17)
Contextual-Function <- [
  Method <- [ "Challenge-Mappings"]
  Claim <- [
    State-of-Affairs <- Two kids living in same home
                           are treated in the same way
```

Epistemic-Predicate <-- not true]

RETURNING TO: CHALLENGE-DIRECTLY/STEP 1

STEP 2:

HEAD-CCS = C6

& C6.Goal = "Support" & C6.Method NE "analogy"
Therefore C7.CounterSupports <- C17

RETURNING TO: CHALLENGE-CHOICE/STEP 2

Expectation <-- [
Function <-- Challenge-Choice
Speaker <-- R
Context <-- C17]

Expectation-list <--
((Challenge-Choice,R,C17), (F-C,M,C7), ...)
Expectation <-- nil
Type-Further-Challenge <- Nil
go produce-next-move

Bolt Beranek and Newman Inc.

Report No. 4681

8. MAJOR PRINCIPLES/CLAIMS OF THE CONTEXT SPACE THEORY

In this and the subsequent chapter I shall highlight and re-characterize some of underlying principles and claims contained in the context space discourse theory. The focus of this chapter is to address the following issues:

1. Distinguishing between "selective attention" and "frame-of-reference" processing.
2. Discussing the potential need for a "backtracking" mechanism in the grammar.
3. Characterizing a sense of structure common to all forms of discourse engagement.

In Chapter 9, I address the following issues raised by the context space grammar:

1. Distinguishing between communicative goals and speaker intents.
2. Distinguishing between the grammar's "linguistic" theory of discourse and more traditional linguistic theories that rely on a "the meaning is in the text" view.

8.1 Selective attention and a frame of reference

I have earlier claimed that the grammar's notion of "focused processing" is analogous to a psychologist's notion of "selective attention." In sections below, I first review this correspondence, and then go on to argue that, in fact, both focused processing and selective attention can be subsumed by a more general notion like "frame-of-reference" processing.

8.1.1 Focused processing and selective attention

The grammar's notion of focused processing and its limitation of single communicative goal achievement parallels current/past psychological research on "selective attention," and the notion that an individual is a "limited-capacity processor." As discussed below, there are even stronger correlations between the context space theory and notions like selective attention.

As noted by many psychologists, cognitive processing usually entails using preattentive processes to segment and distinguish elements which are then attended to [98, 100]. The discourse model presented here similarly recognizes the importance of segmentation and processing over a selected field of focal attention. It is generally assumed that cues and expectations are among the primary elements directing an individual's segmentation and focusing choices [67, 122]. The grammar, similarly, uses cues and expectations to direct its segmentation of utterances into constituent context space constructs.

For example, "clue word" and "explicit shift mechanisms" [90, 112, 119] are major features of the discourse grammar. These clue words usually preface the substantive remarks of a speaker's conversational move. They often indicate that the speaker's utterances will entail a context space shift, and that, hence, a different segment is about to be put into the field of focal attention. In attending to the subsequent active context space, our field of focal attention is limited to it and the controlling context space in direct relation to which the active space is being developed.

Selective attention is clearly a major aspect of most cognitive processing tasks, and it has been used in this work as a means of explaining many discourse phenomena. However, I believe that "frame-of-reference" processing provides a somewhat more general and encompassing explanation for these discourse phenomena, and for selective attention processing in general. In the section which follows, I develop and argue this position further.

8.1.2 Discourse processing and frame-of-reference identification

Most everything we do and perceive is in relation to some single fixed frame of reference. For example, riding in a train, we see the train (and ourselves) as moving by viewing the landscape as standing still, or we view the train (and ourselves) as stationary while the landscape moves.

Frame of reference processing involves understanding one unit in terms of a fixed other. It, therefore, presupposes an ability to segment and differentiate between the unit serving as a frame of reference and that unit being analyzed in relation to the reference frame. A frame of reference provides a schematic structure in relation to which subsequent processing is performed. In discourse, it provides the necessary context that directs subsequent generation and interpretation. It provides a framework for a listener to identify the "point" of a speaker's utterances. As noted earlier, the point of a speaker's utterances is often reflected in the communicative goal served by the context space containing her/his utterances.

A discourse reference frame governs subsequent interpretation in much the same way that an individual's choice of reference frame governs whether s/he will see the train (and her/himself) as moving or stationary. Since the communicative goal of an active context space relates to the preceding controlling context space, it follows that a frame of reference includes both the controlling and (subordinate) active context space. This is somewhat analogous to a main verb (and any adverbials processed thus far) being the frame of reference used to interpret subsequent adverbial phrases.

Developmental studies of children's discourse engagement and procedures in perception tasks (like comparing or contrasting attributes of objects) bears out the need to differentiate between a notion of "attention" and "frame-of-reference utilization." Young children do attend to other children's utterances; their utterances do make mention of elements mentioned by a preceding speaker. Yet, their responses are somehow not "in tune" with a preceding speaker's. In both perception and language generation tasks, young children use "local" rather than "wholistic" procedures [41, 73]. That is,

their procedures do not rely on some external frame of reference, and their objects of study and creation are disconnected islands.

As shown by Karmiloff-Smith, children's models of extended discourse generation only begin to approximate the adult model when children replace their local procedures with more wholistic ones. They begin to organize and segment their utterances into larger units, and their subsequent linguistic forms, like those of adults, tends to be dependent and driven by such unitization. Similarly, in perception tasks, we see a developmental trend away from local procedures to ones that involve processing in terms of a fixed frame of reference [41].

Since wholistic organization and its use as a frame of reference, rather than selective attention, is the major factor of the developmental growth of a child's model of discourse to that of the adult model (and similarly for the child's perception procedures), it follows that wholistic organization and frame of reference processing must be a major, mandatory element governing maxim-abiding extended discourse engagement.

8.1.2.1 Frame of reference and point of reference

I have already shown elsewhere [112] that discourse partitioning elicits Reichenbach's point of reference for the processing of tensed verbs [111]. I would claim that a major aspect of a reference frame is Reichenbach's point of reference for verbs. And, that hence, changing a point of reference entails changing the reference frame that will be used in subsequent discussion.

In order to forestall unnecessary frame of reference shifts, and still be able to refer to events outside of this reference frame, speakers can use certain linguistic devices, specifically the past perfect (future perfect) tense, to refer to prior (future) events. This follows from Reichenbach's observation that the future and past perfect tenses do not introduce a new reference point - hence, they do not necessitate a reference frame shift.

In the excerpt below, for example, the speaker's focus is on the episode involving the speaker's discussion with Mary, and not the episode in which

Kurt spoke to Mary about the speaker. By citing the event in the past perfect tense, the speaker is able to introduce this event without causing a subsequent context space shift and accompanying shift of reference frame onto this prior episode.

Simple Past: "Mary's reaction this time was, um, "Why are you doing that?" Starting to be negative. So it was clear

Past Perfect: that Kurt had said something to her.

Simple Past: And then I didn't really want to talk to him."

Notice that the time reference point for the speaker's subsequent simple past tense utterance is the same as that of the first clause in the simple past. The original time reference point has not been supplanted.

In contrast, in the following excerpt, where a speaker's subsequent utterance begins a new communicative goal in the midst of another (i.e., an Interruption relation, as signalled by the speaker's use of the clue word "Incidentally"), and which therefore results in a context space and accompanying frame of reference shift, the original time reference point is not immediately available and its respecification is required.

"He made a comment to me about, uh, I'm not too sure what it was, something about the Portuguese people. Incidentally, while I was standing there, I noticed ..."

8.1.2.2 Discourse deictics

Let's now reconsider conversants use of deictic expressions in discourse. In general, deictic referring expressions necessitate a reference system. "Close" locative deictics, such as "here," are used by speakers in reference to their own physical space; "far" locative deictics, such as "there," are used to refer to the listener's space. This results from the speaker's physical space constituting his/her physical reference frame. In the excerpt above, for example, the speaker uses "there" because her current physical space is not identical to the physical space being referenced in the excerpt.

However, there is another sense of reference frame which influences a speaker's choice of deictic referring expression. I call such uses discourse deictics. Discourse deictics, do not depend on a speaker's physical reference frame, but rather, depend on her/his discourse reference frame⁷⁴. Examples of discourse deictics presented earlier in this thesis (see Chapter 5) were, for example, a speaker's use of "there," "here," "these," and "the" versus "that X," to refer to constituents of a preceding context space. Other examples of such discourse deictic uses can be found in [36, 85, 113, 119] among others.

As demonstrated in Chapter 5, speakers only use discourse close deictics to refer to elements of the active and controlling context spaces. This follows from the fact that a speaker's discourse reference frame is limited to these two spaces.

8.1.3 Selective attention and reference frame identification

Given the importance of reference frame processing, it is possible to posit that frame-of-reference, rather than selective attention, is the primary explanation of many discourse phenomena. For example, using frame of reference criteria, it simply follows that a speaker's utterances are interpreted as communicating a single communicative goal in relation to a single preceding controlling context space. Focused processing is only a symptom not a cause of this phenomenon - we can only use a single frame of reference at a time.

Comparably, let me now re-characterize my earlier analogy between discourse focused processing and possible selective attention procedures governing our single-view perceptions of ambiguous figures like the "Peter-

⁷⁴ However, the locative/physical frame can over rule the discourse reference frame rules. Specifically, the use of "here," in general, cannot be used by a speaker in reference to any other physical location than the one s/he is presently at.

Paul Goblet," the "Young Girl-Old Woman," the "Necker Cube," and the like. I now would argue, that both are manifestations of our processing being limited to a single reference frame. As noted by Attneave, each distinct view of these ambiguous figures really involves a unique reference system [5]. As we only use one reference system at a time, we can only process one view at a time.

Thus, the context space theory's emphasis on "relevant discourse context" identification, can really be thought of as stressing discourse "frame-of-reference" processing. The claim here, then, is that discourse processing, like most other forms of cognitive endeavors, proceeds by individuals understanding something in relation to some frame of reference. In discourse, this frame of reference is a current controlling and active context space pair.

8.2 Fixing up context space boundary points

As discussed above, a major component of the context space analysis is the principle that subsequent discussion is always generated/interpreted in terms of some fixed frame-of-reference. As noted, this principle accounts for the high level of focused processing that we find in discourse. And, in turn, explains the fact that, unless otherwise signalled, listeners will usually interpret a speaker's utterances in relation to the frame-of-reference established. Sometimes, however, midstream, speakers switch their reference frames without signalling this to a listener. This seems to happen most often during narrative retelling. In the section below, I discuss such occurrences and its effect on listener interpretation of a speaker's utterances - specifically, a possible need for a listener to retrospectively restructure his/her context space structuring of a speaker's earlier utterances.

8.2.1 Misleading story development

A major feature of discourse unitization and segmentation is communicative goal identification. Using our discourse expectations, clue word shift mechanisms, and formalization of standardized conversational moves, we have some good idea of which communicative goal (and hence slot filler) is currently being developed.

Our guesses, however, are sometimes incorrect. For example, while it is usually the case that a speaker will linguistically mark a digression, sometimes s/he fails to do so. In such unmarked cases, we are likely to process the digression in the same frame of reference as preceding utterances. Eventually, either through our own detection or a speaker's "retroactive" signalling, we realize that a different frame of reference was meant to be used for the digression. Such occasional unmarked digressions usually appear in narrative discourses.

As discussed by a number of researchers (e.g., [133, 72, 89, 77, 68, 105, 114]), and as captured by the formalization of the "narrative context space" in Chapter 4, an orientation section frequently prefaces the body of a narrative. In the orientation, a speaker usually introduces the protagonists, time, and location of a story's events.

Under the assumption that discourse processing is highly focused and is in terms of single reference frames, it follows that speakers should only tell what is relevant to a particular frame of reference (Grice's rule of "Quantity"). Given a number of predication about a character in the orientation section of a narrative, a listener will assume that these predication are relevant and will be needed in later interpretation of the body of the story.

When we cannot find such a connection, we are confused; we interrogate the speaker, assuming that we have missed something. For example, if you tell me in an orientation section that Mary is an excellent cook, I will be confused if the point of the story and its development does not in some way rely upon Mary's culinary talents, and at some point will probably say, "But what about Mary's cooking?"

Alternatively, the speaker may realize that some character predication are irrelevant (and have not been so signalled) before the listener does. S/he may then say something like, "But anyway ..." This phrase indicates to the listener that contrary to expectation and one's usual rules of story development, preceding predication are irrelevant to the story. They should be taken out of the active narrative space and should not be used in subsequent interpretation. Since no previous signal to this effect had been given, some restructuring of our context space partitioning seems necessitated in such cases.

I have not seen enough of this "backtracking" form to give a formal specification on the number of preceding predication that the "but anyway" takes out of the active space. And, such backtracking mechanisms have not as yet been encoded within the grammar. At best I can say that the type of backtracking involved here seems only to apply to preceding predication of one character, and only to those predication dealing with one general quality (e.g., if four preceding predication discuss Mary's cooking and the one before these four discusses her being a student, the "but anyway" probably applies only to the last four).

I raise this issue merely to point out to the reader that at times context space boundary lines may be fuzzy, or only realized after the fact. Shift mechanisms are not always used, and, as a result, context space boundary points are not always self-evident and fixed.

8.3 Cognitive structuring of information

As stated in the introduction to this thesis, and illustrated in much preceding discussion, the grammar's design and underlying principles are consistent with other theories of cognitive processing. Frame-of-reference processing, cues, expectations, and segmentation are but some of these shared principles. Let me now highlight another feature of correspondence - structure. In particular, I would like to point out that the grammar's

hierarchical partitioning of an ongoing conversation is consistent and complementary to cognitive theories which posit that individuals comprehend their environment in a hierarchically structured way. Discourse utterances are but an object of perception.

As I discuss in later sections of this chapter, the term "structure" has many orthogonal senses and is often used by researchers in a somewhat loose and nondiscriminatory fashion. As I shall argue, such nondiscriminate uses have (in my opinion) led to the somewhat vague and misleading claim that each particular discourse form (genre) has its own unique underlying structure. In this section, I would like to characterize and highlight the efficacy of distinguishing one particular sense of structure which, I believe, underlies all discourse forms.

8.3.1 The Abstract-Context-Space-Schemata

The main force of the context space theory is delineation of general rules of "maxim-abiding" discourse processing. As illustrated in the body of this thesis, the rules identified operate in many forms of discourse engagement (teaching dialogues, debative dialogues, narrative dialogues, etc.), and they are dependent on, and derivative from, the identification of a discourse's basic underlying structure and constituent components. This basic structure is what I shall call the Abstract Context Space (ACS) schemata.

At the ACS level, a discourse structure is no more than a hierarchical organization of context spaces corresponding to possible conversational moves legal in a discourse. At this level of characterization, there are no slot names like "Counterclaims," or "Mappings," which are specific to particular functional thematic developments found in particular pieces of text. Rather, a context space is merely an abstract structure with slots for:

1. a propositional representation of the discourse utterances said to lie in the space;

2. the communicative goal served by the space;
3. propositional representations of implicit components needed for the space to serve its communicative goal;
4. the influential status (i.e., State) of the space at any given point in the discourse;
5. links to preceding discourse context spaces to which this space has some relation with a specification of the type of relation involved;
6. links to subconstituent context spaces;
7. focus level assignments to constituents of the utterances said to lie in the space.

If we use this level of characterization, all discourse utterances, whether of narrative, technical discussion/explanation/description, or argument form, share the same structure. After characterizing possible state and focus level assignments, and the scope and nature of change allowed at any given point, we can then specify a single set of rules which is applicable to, and governs all discourse forms. To mention but some of these rules:

- o A conversation is a series of conversational moves, each move corresponding to a speaker's communicative goal in relation to a current controlling context space.
- o Utterances in a single context space serve the same communicative goal.
- o All conversational moves have an associated set of preconditions and effects - the preconditions and effects are derived from, and operate on, the discourse's underlying deep-structure.
- o At any given point, the current relevant discourse context governing subsequent discussion is the active and controlling context space pair.
- o Closing a context space results in all of its constituents being given zero focus level assignments.
- o Putting a context space into a generating state, results in a reassignment of its high focus constituent to a medium focus.

- o A context space having an open state assignment, reflects that it is expected/required that the space be resumed and completed after completion of the digressive context space.
- o Closed context spaces can be ignored in the discourse popping process.
- o Discourse popping results in the closing of all context space developed during intervening discussion (i.e., those not already closed).
- o Generation/interpretation rules only access context spaces in a current relevant discourse context.
- o Clue words like "but," signal that an active context space should be closed; clue words like "By the way," signal that an active context space should be reassigned an open state.
- o Clue words like "now," and "like," signal that a subconstituent, subordinate context space is about to be developed.
- o During development of a subconstituent space, the superordinate space is assigned a controlling State assignment.
- o Close discourse deictics can only be used for constituents in a controlling or active context space;
- o Pronominal reference can only be used to refer to a constituent in "high focus" in a controlling or active context space (subject to some intersentential syntactic exceptions).

During actual discourse, however, we clearly have to become a bit less abstract in order to recognize particular communicative goals; to perform specific State assignment updatings, and the like.

I would claim that the main force of this work has been to identify this most abstract level of discourse structure. In light of this it is worth noting that the discourse ATN grammar described in the thesis has been developed merely as a means of illustrating a formalism and some of the major mechanisms needed to model such high level features of discourse processing. So, for example, it is mainly irrelevant to the enterprise how many individual conversational moves (or modes for fulfilling these moves) have been encoded in the grammar. In addition, it is mainly irrelevant how many slots like

"Support-Principle," corresponding to particular inferential components needed to identify specific moves, have been identified.

What is relevant is that (among other things):

(1) There are constraints and actions along the grammar's arc transitions. (2) These constraints and actions access registers set by preceding conversational moves, reflecting the context-sensitivity of discourse engagement. (3) The grammar has an Expectation register. (4) It has room for clue word generation. These clue words direct its processing of subsequent utterances, and will preface its own utterance generation. In addition, the clue words are generated before substantive utterance generation. (5) It correlates a conversational move with a communicative goal. (6) It recognizes different methods of communicative goal achievement. (7) It partitions all utterances referring to a single communicative goal into a single context space. (8) There are slots to hold implicit components - inferential elaborations - of a conversational move. (9) The grammar updates its discourse model during, before, and after a conversational move. And (10) its generation/interpretation rules, in the main, only access an active and controlling context space pair.

These features of the grammar, I claim, are needed for modeling discourse of whatever form. These features of the grammar correspond to the Abstract-Context-Space schemata described above.

8.3.2 Genre specialization

In contrast to the abstract context space approach which attempts to find common underlying structures and rules governing all discourse forms, a number of text/discourse researchers emphasize characterization and differentiation instead. These researchers posit that one can delineate any number of discourse genres, and that "each particular discourse genre has its own characterizable and predictable structure." In the sections below, I present a brief review of the many orthogonal ways researchers have used the term

"structure," and I argue that only under some of these particular interpretations is the genre-structure claim true and/or useful.

8.3.3 What does structure mean?

The term "structure" is somewhat amorphous, applicable to many different levels of abstraction, perspective, and description. For example, in a recent article describing "good" writing skills, Collins & Gentner [31] state:⁷⁵

Using structures that are easy to recognize, such as tree structures, lists, and tables, is one important strategy.

This use of structure seems highly general, abstract and related to some notion of "architectural design."

On the other hand, later in the text, Collins & Gentner seem to have a slightly different notion of structure in mind:

Pyramid Form. Any text can be structured so as to cover the most important ideas or events first and then to fill in more and more detail

Story or narrative Form. Any text can be structured according to the temporal and causal relations between the events that occurred. ...

Argument Form. ... One version of the form is: introduction, background, definition of issues, statement of what is to be proven, ...

Process-Of-Elimination Form. This is a kind of inverted pyramid structure where the writer makes an argument by eliminating all possible alternatives (a form used by Bailyn, 1967). ...

Here, the notion of structure seems to refer to forms of content-relational description. Does a set of causally related events form a list or a tree

⁷⁵Emphasis my own

structure? Are terms like, "introduction," "causal relation between events," and/or "definition of issues," abstract design features in the way that "trees" and "tables" are?

To add to the confusion, Collins & Gentner, for example, refer to the use of metaphor in text not as structure, but rather as a "stylistic device." In contrast, according to Meyer [90, 91], metaphor (or comparison as it is called in her work) is properly called "Top-level structure." Meyer lists five such structures:

- o antecedent/consequent, comparison, collection, description, and response.

Who's right, Collins & Gentner, or Meyer? Why don't they agree on comparison, whereas they seem to agree on antecedent/consequent? Where in Meyer's work is the notion of tree, list and/or table?

8.3.4 Structure and schemata

As if the above confusion were not enough, the term "structure" is frequently interchanged with "schemata." For example, Meyer discussing an author's use of "linguistic cues" (e.g., "in contrast," "on the other hand," and "however") states [91]:

More specifically, they (i.e., cues) explicitly or implicitly suggest the type of top-level structure or schematic structure to use in interpreting the topic.

But, like structure, the term "schemata" is itself somewhat amorphous, used in orthogonal ways. For example, Rumelhart, attributing the term "schema" to Kant (1787) and Bartlett (1932), claims that schemas encode in structured, unitized packets, the generic and instantiated concepts representing our world knowledge [115]. This definition of schema, is similar to the following definition offered by Sheridan [126]:

Schemata represent generic concepts which are stored in memory. These generic concepts include underlying objects, situations, events, actions, and sequences of actions.

Under such description, schemas are usually meant to refer to "scripts" containing prototypical series of actions applicable in stereotypic situations (e.g., the restaurant script à la Schank&Abelson [118]), "frames" containing prototypical descriptions of actions/objects (e.g., a face or room frame à la Minsky [93]), and/or "semantic networks" à la Collins & Quillian [28]. When researchers claim that schemas are fundamental to text interpretation, they are usually referring to these forms of content world-knowledge schemas.

However, schemas are also used to refer to content-independent "structures of organization." For example, Mosenthal states [97]:

Schemata are often defined as the expectations people have concerning the parts which should occur in stories and paragraphs and the relationship which should occur among the parts.

Let us note that this does not contradict anything previously stated about schemas, since, the notion of an "oral narrative" is just as much a generic concept in memory as is one's concept of "being in a restaurant." However, there does seem to be some kind of qualitative difference between this notion or application of schema, and the one encompassed in a notion like a Schankian script - similar, perhaps, to the earlier noted distinction between "tree" and "argument" structures.

Anderson, Picher, and Shirey [4] noting such a distinction, distinguish between two types of schemata (as summarized by Lange [80]):

"Textual schemata" embodies knowledge of discourse conventions that signal organization, with specialized conventions characteristic of distinct text forms and other conventions common to most text forms. These organizational schemata include a story schema, a personal letter schema, a news article schema, a scientific report schema, and so on. "Content schemata," embodies the reader's existing knowledge of real and imaginary worlds. "What the reader already believes about a topic helps to structure the interpretation of new messages about this topic."

Returning now to the earlier posed question of whether Collins & Gentner, or Meyer, was right in their respective structure classifications, like with the notion of "schemata," there is no right and wrong. There are merely distinctions. In particular, it is important to recognize that when we refer to "trees" and "main points" as "structures," we do so at orthogonal levels of characterization.

8.3.5 Different genres different structures?

In light of preceding discussion, it seems important to ascertain what level of structure and genre classification researchers have in mind when they claim that "different genres have different structures." Without clarification, the claim is overly vague and evaluation is precluded. In the following, I shall argue that only under some interpretations of "structure" is it true that different genres have different structures. In particular, it is not true under the ACS sense of structure. More importantly, however, I will illustrate that the usefulness of genre specialization and associated claims like the above is largely dependent on the level of structure one is attempting to derive, and the elements of discourse one is trying to explain.

True/False

Under the sense of "structure" referring to content-relational functions, which recognizes a "Counterclaim" as part of an "argument genre" (e.g., this work⁷⁶), "Application" as part of a "make appointment genre" (e.g., [60]), and "Setting" as part of the "narrative genre" (e.g., [114]), the claim that

⁷⁶As further discussed in Chapter 10, while this work does name specific constituents and subconstituents of what may be called different discourse forms, the work does not attempt to characterize these subconstituents in terms of some a priori linear, temporal, and sequential placement in a discourse. In contrast, genre research usually stresses a sequential, ordered, placement of constituents.

different genres have different structures seems acceptable. On the other hand, under the sense of "structure" referring to trees, tables, lists, and/or a hierarchical organization of abstract context spaces, the claim is clearly false.

Good/Bad

The usefulness of the claim similarly depends on the level of "structural control" being referenced. For example, under the sense of "structure" referring to content-relational connections between different parts of a discourse, where one's goal is to account for "typical conversational thematic developments," the claim is probably useful: it allows us to set up specific predictions of what is to come next in a given discourse form.

In contrast, however, under the ACS sense of structure, where one's goal is, for example, to give an account of:

1. the rules governing, explaining, and predicting reference in discourse;
2. the rules governing, explaining, and predicting a speaker's use of "clue words" and "explicit shift mechanisms;"
3. the rules governing, explaining, and predicting discourse popping;
4. the discourse rules corresponding to frame of reference identification and selective attention;
5. the functional aspects of all forms of discourse;

then, the claim is probably quite misleading and bad.

In particular, if, as I have claimed throughout this thesis, rules of discourse are dependent upon a discourse's underlying structure, then, the genre-structure claim would imply that, in the main, there were no general rules of maxim-abiding discourse engagement. Rather, the claim implies that each discourse genre is governed by its own set of particular discourse rules. Such a conclusion, however, is untenable both on philosophical and empirical grounds.

For instance, as exemplified by the varied types of excerpts presented in

this thesis, we see ample linguistic evidence of the same rules of reference and clue word generation being used in "argumentative text," expository text," and "narrative text."

In addition, consider the simple fact that within a single discourse of the kind studied in this thesis many "genres" appear: one minute a narrative is being told, the next minute the conversants are arguing about the "goodness" or "badness" of an actor's action in the narrative. Even further, within the supposed separate logical genre, for example, we have embedded narratives serving as supports/challenges to an opponent's claim. Are we to assume that conversants, then, keep switching their discourse processing procedures and rules from minute to minute?

Lastly, genre distinction, though not synonymous with content on any account, is content-directed via its emphasis on content-relational features of discourse; the ACS structure and the rules derived from it are not at all content-oriented. It therefore seems highly improbable that such a general content-independent sense of structure should be dictated by a more specific content-dependent notion like genre.

Thus, while at times, for some purposes, we may want to distinguish genres of discourse (but even this not necessarily), we certainly do not always want to do so. And, in particular, we clearly should not want to support such blanket statements like, "Genre dictates structure."

In conclusion, there seems to be a minimum of three separate, orthogonal, levels of structure at the text level: (1) content schemata; (2) textual schemata/genre; and (3) an abstract non-content oriented level of structure common to all forms of discourse engagement, which I have called the Abstract-Context-Space (ACS) schemata.

Bolt Beranek and Newman Inc.

Report No. 4681

9. A LINGUISTIC VS WORLD KNOWLEDGE THEORY

There has recently been a great upsurge of text/discourse research largely based on the identification of speaker beliefs, intents, goals and plans. This trend has culminated in the view that a "functional," "world knowledge" approach - in opposition to a linguistic/structural one - is what is required for discourse analysis.

Let me here re-emphasize something stated much earlier in this thesis: this work is not in opposition to any claims that world knowledge is needed or accessed in discourse engagement. Of course it is - much as an ordinary lexicon of the language might be. This work merely adds that in addition to such knowledge, there is some discourse-specific knowledge that is needed and used in discourse processing.

However, as an outcome of certain stances taken by traditional approaches to linguistic theory (à la Harris [56], Chomsky [22], Katz&Fodor [71], Harweg [57], and others) proponents of the "world knowledge" school seem to believe that any linguistic/structural theory necessarily entails the notion that meaning is "fixed" and "inherent" in the words of a piece of text. Based on such an assumption, the world knowledge theorists often claim that a linguistic theory, by definition, cannot accommodate the functional and contextual features inherent in extended discourse.

As amply illustrated in this thesis, the discourse grammar developed here incorporates both a functional and contextual approach in its analysis. However, its notion of function does perhaps differ from that of the world knowledge theorists. As I shall argue below, the world knowledge theorists have a very strict and narrow view of function. I shall illustrate that there is a sense of function which is vital to discourse processing which their work does not generally recognize, characterize or deem important. I will also highlight a number of discourse phenomena identified in this work that strongly demonstrate that a purely non-linguistic, general world-knowledge approach to text, by itself, is insufficient for the task.

9.1 Communicative goals versus speaker intent

Let me open this discussion by describing the grammar's distinction between a speaker's "communicative goal" and his/her underlying psychological motivation for saying what s/he does. To this effect, we can begin with a brief historical overview of the developing role being given to "speaker intent" identification in discourse analysis.

In a radical departure from the traditional philosophical correlation between "meaning" and truth/falsity, Austin in 1962 introduced a distinction between performative and constative utterances [6]. Austin claimed that the notions of truth and falsity cannot be applied to performative utterances; performatives perform actions - they are not true or false. For example, stating, "I name this ship Liberty," under appropriate circumstances, results in the ship being so named, and is not open to a true/false analysis.

This distinction in utterance type led to the well known theory of "Speech Acts" à la Austin and Searle [6, 124]⁷⁷ and "Conversational Implicature" à la Grice [46]. Fundamental to the speech act theory of language is an emphasis on the "functionality" of language, and the need to distinguish between the force of an utterance and its literal content. Associated with all speech acts are a set of preconditions and effects. Preconditions, in the main, refer to a speaker's psychological state, social status, and the functioning of the "real" world: Effects refer to changes in the external world including the mental states of others. For example, the "naming a ship" act can only have its intended effect of the ship being so named, if its precondition that the person doing the naming has authority to do so is true.

⁷⁷There are of course major distinctions between Austin and Searle's works. In particular, Searle using Grice's notion of speaker intention [45] uses psychological motivation as the source of determining the force of an utterance, whereas Austin's forces stem more directly from social organization rules in the external world.

A major precondition of all speech acts is the sincerity condition/implicature. As Searle states [124]:

to assert, affirm, state (that P) counts as an expression of belief (that P). To request, ask order, entreat, enjoin, pray, or command (that A be done) counts as an expression of a wish or desire (that A be done). To promise, vow, threaten or pledge (that A) counts as an expression of intention (to do A).

The work presented in this thesis is also based on recognizing the functionality of discourse, and the preconditions and effects associated with different communicative acts. However, the grammar's characterization of a communicative act is, in the main, specific to a maxim-abiding, structural and functional thematic development of the discourse, not to underlying psychological motivation. The communicative acts, or goals as they have been referred to throughout the thesis, are derived from the discourse structure and certain logical/semantic rules of inference: they are not derived from access to a speaker's psychological goals, beliefs, plans, and/or social status in the real world. An act's preconditions stem from the preceding discourse structure, and its effects are on this discourse structure, not on arbitrary states of the world. The role of the grammar developed here is to express the constraints inherent in linguistic communication, within which the psychological motivations of this latter sort must operate. A discourse grammar operates in conjunction with such a psychological component to actually generate or interpret utterances. Neither model alone is sufficient to model human discourse performance.

What types of communicative goal rules are encoded in the grammar? Well, for example, the rule that in the context of an ongoing debate, the force of a speaker's "Why" question following an opponent's "So What," is a challenge, whose effect is to set up the discourse expectation that the addressed conversant will replace her/his previous flat dismissal with a substantive challenge. There is also the contrastive rule that the effect of such a "why," following an opponent's assertion of a claim, is to set up the discourse expectation that the addressed conversant will give some support to

this assertion. And, lastly, there is the rule that in discussion mode, a speaker's "why" is to be interpreted as a request for explanation.

In all cases, whether the "why" is motivated by a sincere desire for the information, a hatred of the opponent, an attempt to save face or to give oneself more time to think, is in a sense orthogonal to this analysis. No matter what psychological state the speaker is in, no matter what psychological state the addressed conversant is in, the why question, in the differing discourse contexts, serve their respective illocutionary forces with their own distinct set of effects on the discourse structure.

It is of utmost importance to stress this distinction between a conversant's psychological motivation for saying what s/he does, and the communicative effect of the speaker's utterances in a given discourse context. Though not intending to insult, the speaker may yet insult, though not intending to challenge the speaker may challenge, though not intending to shift the topic, structurally, the speaker's utterances may cause a shift in topic.

Let me take this notion even further. Not only can an utterance get its illocutionary force independent of a speaker's intent, but, in addition, even where listeners may know that the force of the utterance does not necessarily correspond to a speaker's intent, the effect of the utterance will remain the same. For example, consider a case where a person A is not invited to a party that person B is invited to. In addition, A is on very friendly terms with the people having the party. B tells A of the party, and A says, "Oh, I think I'll go," and B says, "You weren't invited." A, though realizing that B is not being rude and implying to A that she is not wanted, feels the utterance is rude. The force is attributed to the utterance in its context, not to the speaker.

In contrast, many researchers claim that psychological intention is the primary, prominent feature governing discourse processing. For example, let's consider Spiro's statements below [129, p.250]:

When comprehending utterances in conversations, the speaker's intent is all that is attempted to be communicated. If that intent is

apprehended, the goal of communication is met and the communicative act is "understood."

I would claim that the thing that needs to be identified (rather than speaker intent) is the speaker's "communicative goal:" a structural connection between a speaker's utterances and the preceding discourse (not an underlying psychological intent). These "intents" are derivable from the discourse context. For example, as illustrated earlier, the context-space grammar uses expectations set up by preceding conversational moves, clue word indicators, and formal logical/semantic criteria to identify the force of a speaker's utterances as a challenge. I do not believe that in deriving such an interpretation we (or the grammar) need to posit that the speaker desires or wants this challenge.

This is not to deny that a speaker's psychological intention is often reflected in the communicative goal served by his/her utterances; it is merely to deny that the two terms are synonymous. There usually is a correspondence between a speaker's intent and communicative goal, stemming, in all probability, from individuals, over time, acquiring standardized procedures for ways in which to express underlying intentions, beliefs, and desires (*à la* Lewis' [83] and Bennett's [9] notion of "convention"⁷⁸). If the convention hypothesis is correct, we could, then, posit that rather than speaker psychological intent identification driving the interpretation of a speaker's utterances, it is interpretation of his/her utterances via possible conventionalized communicative goal characterizations which enables us to hypothesize the speaker's underlying psychological state.

Searle himself alludes to the inadequacy of an intentional account alone. In particular, in discussing Wittgensteins' observation that we can't say "it's cold here," and mean "it's warm here" [141], Searle expands the Gricean

⁷⁸Though, like Austin, both Lewis' and Bennett's notion of convention focuses on organizational rules of society, rather than on conventional rules of discourse engagement.

view to account for the fact that "meaning is more than a matter of intention, it is also a matter of convention" [125, p.46]. Elaborating on this point, Searle states:⁷⁹

In the performance of an illocutionary act the speaker intends to produce a certain effect by means of getting the hearer to recognize his intention to produce that effect, and furthermore, if he is using words literally, he intends this recognition to be achieved in virtue of the fact that the rules for using the expressions he utters associate the expressions with the production of that effect. It is this combination of elements which we shall need to express in our analysis.

In general, however, Searle does not explicate these rules of linguistic convention, and in particular he does not mention or seem to recognize the rules of utterance-force as derived from rules of "well-formed" discourse structure. The thrust of this thesis, then, is a major departure from some of the assumptions that underly much of the other work in "speech act" theories.

9.1.1 On the issue of text linguistics

Since a main point of this work has been a formalization of a discourse grammar purporting to characterize many aspects of "maxim-abiding" discourse solely in terms of a discourse structure, without reference to particular speaker beliefs or world knowledge, it seems most appropriate that I comment on a recent article by Morgan & Sellner [95]⁸⁰ wherein the authors claim that discourse analysis is best subsumed under a theory of world knowledge,

⁷⁹Emphasis my own.

⁸⁰While I agree with many of the criticisms that Morgan&Sellner cite against certain text theories (works I myself address in Chapter 10) I do not agree with their main conclusion on the issue of text linguistics. It is this conclusion that I wish to discuss here.

intention, and action - in total disregard of rules particular to discourse engagement.

Morgan & Sellner's main argument against a "linguistic" theory of discourse, seems to rest on the claim that much of discourse "coherence" merely corresponds to the "coherence" found in the external world. The authors arguments, as presented in the article, are best summarized by the following quotes:

Knowledge that, in English, the determiner precedes the noun (as opposed to many languages with the opposite order) seems to follow from no other fact of the psychology, culture and so on of the people who speak English. It seems to be, then, a strictly linguistic piece of knowledge and, as such, in the domain of linguistic theory.

In a syntactic theory, the objects generated are strings of words, each with an associated structural description. The grammar, by virtue of its mathematical properties, makes unambiguous claims about possible strings of words and about what structural description is associated with a given sentence.

In contrast, resting many of their arguments on story grammar analysis [109, 110, 114], the authors use the following arguments to dismiss discourse from the domain of a linguistic inquiry:

First and most obviously, stories have content: the facts and events that make up the "world" of the story; not functional relations, but just the kind of relations that hold between the facts and events of the real world: temporal order, relations of causation, motivation, and so on. The most appropriate system for describing this aspect of story content, then, is a system for describing facts and events in the world.

As to "presentation structure," which one would think has some relation to linguistic theory, the authors claim:

A second and very different aspect of the content of a text is the manner in which the world is described: the storyteller's choices concerning which points of content to present explicitly and which to leave to the hearer to infer; what order events should be presented in and so on. ... The most appropriate system for describing this aspect

of story content is a system for describing intentions, goals, purposes, and plans; a full-fledged theory of acts would be a start. Note that this aspect of a story is not a matter of linguistic form.

In commenting on story structure they claim:

The ability to impose some kind of organizational structure on the events narrated in a story is most likely the same ability one uses in imposing structure on observed reality.

On surface linguistic phenomena they assert:

As far as we can see, there is no evidence for cohesion as a linguistic property, other than as an epiphenomenon of coherence of content.

In the sections to follow, I argue that:

1. Everything we do, including sentential linguistics, corresponds to our view of the external world and necessitates access to this world.
2. A cogent, cognitively plausible theory of discourse must overlap with our general cognitive processing capabilities.
3. Many discourse features - communicative goal processing, discourse popping, surface linguistic phenomena - cannot be explained solely by a general theory of actions, beliefs, plans and psychological motivation. In addition, they depend on a theory of discourse structure and rules specific to this structure.

9.1.1.1 Sentential versus text analysis

Morgan&Sellner's argument that sentential linguistics is "mathematical," and not dependent upon, or derivative from correspondences to the "real" world, is highly unmotivated and in direct contradiction to many linguistic

pragmatic theories of sentential linguistics current in today's literature.⁸¹ Their use of such an argument to differentiate between text and sentential linguistics is, therefore, ill founded.

1. A purely syntactic analysis often cannot provide a single unambiguous structural description of a sentence. There are numerous examples of structurally ambiguous utterances whose disambiguation clearly necessitates or depends on external world knowledge and/or a preceding discourse context.
2. Many linguists would argue that "pragmatic" considerations govern much of sentential level construction and interpretation. Fronting an adverb [21], aspect [32], gapping [75], and the like, are seen as relationally based and predictable from semantic and pragmatic relations.
3. Our basic elementary objects of linguistic analysis - nouns/subjects, adjectives/adverbs, and verbs (or agents/predicates/instruments à la Fillmore [35]) directly reflect the nature of our external world (or more appropriately, our view of it): things with particular attributes that act and that are acted upon.

If a non-correspondence to our perceptions of the real world, non-use of basic cognitive apparatus, and non-access to world knowledge are necessary criteria for a linguistic study, then, "linguistic inquiry" is a dead field.

9.1.1.2 A Cogent theory of discourse processing

Extended discourse is only one of the many cognitive tasks which people perform. Of course, there are correspondences between the way people perform this task and the way they go about performing others. In fact, a major point of this work has been to stress that the grammar's underlying features and

⁸¹Their use of this argument is exceptionally odd as in another article, Morgan explicitly notes that "it is slowly becoming clear that there are a number of kinds of correlations between pragmatic and syntactic form" [96].

criteria of design are consistent with known cognitive operators and features used in the processing of many other cognitive tasks. A non-overlap, rather than an overlap, is the cause for alarm. For if individuals used some remarkable unique cognitive ability in discourse processing, we would have to wonder why they made such limited use of this ability. As Adams notes in her discussion of children's syntactic processing procedures [1, p.26]:

Moreover, a remarkably close temporal correlation between the development of related logical and linguistic skills is often observed (e.g., Olson, 1970; Palermo & Molfese, 1972; Tapin, Staudenmeyer, & Taddonia, 1974). Almost certainly, this is not mere coincidence. It would seem more likely that the emergence of both kinds of skills presupposes the acquisition of some common conceptual structures.

It is in fact only reasonable that a significant amount of the connectivity between the sentences we generate, and the sentential and discourse structures found in our conversations, correspond to our view of causal, temporal, and structural relationships existing between objects in the outside world. How could we describe things that we did not perceive? How could listeners comprehend structures that their "limited processing capacitors" could not handle?

9.1.1.3 The need for a linguistic theory of discourse

Of more relevance against Morgan&Sellner's claim that a linguistic, structural analysis of discourse is misguided, is the many discourse phenomena that we find in an analysis of naturally ongoing dialogues - surface linguistic forms, discourse popping, the functional relation of a speaker's utterances to the preceding discourse - that simply cannot be explained by the "structure" of the outside world.

For example, in Chapter 5, I have demonstrated that a structural decomposition of a discourse into constituent context spaces with varying influential status, explains and predicts the numerous seemingly "strange," uncalled for forms of reference found in spontaneous discourse. For example,

I have illustrated that when returning to an "open"/"controlling" context space, speakers immediately repronominalize their references to entities contained in these spaces, despite potential semantic contenders for such references in intervening "talk." In contrast, I have shown that on return to a "closed" context space, or reference to an element last mentioned in a context space whose current influential status is "closed," speakers use full descriptors to refer to the entity in question, despite the fact that no seeming semantic contenders have been interveningly introduced.

Alternatively, I have shown that the criteria dictating the retelling of a narrative in spontaneous discourse, and the structural decomposition of the narrative into the discourse structure, is not merely a reflection of the structure of the episode as it occurred. For example, when the telling of different events of a single episode serve different speaker communicative goals, we find speakers partitioning these different portions of an episode into distinct context spaces. This structural decomposition is reflected by a speaker's surface linguistic clue words, such as "Incidentally," and respecification of portions of the orientation section just given (usually time and location orientation, e.g., "Incidentally, while I was standing there"). It would be a difficult position to maintain, or prove, that while the episode was occurring these distinct events were separately segmented into different structural components in one's long term memory. In fact, it is quite possible that on one occasion events A, B, and E of an episode are put into one context space, and events C and D, of this same episode, are put into a separate context space, while on another occasion, events A and D are put into a single context space. One's structuring of discourse utterances relating to a single episode, one's choice of which events to retell, is a dynamic process - dependent on the flow of the preceding discourse (as well as the intentions of the teller) rather than on some notion of "truth" in the outside world.

Correspondingly, I have illustrated that in discussion of analogies, and rejections thereof, a speaker's choice of citation of (non)correspondences is governed by the discourse structure, and communicative goal being served by

the analogy. The actual structures of the respective domains and their full set of relations and (non)correspondences to each other, are not the criteria governing presentation in discourse.

In answer to this, Morgan&Sellner may choose to respond, "But, we allow for communicative goals governing a speaker's choice of utterances." Yes, they do, but one of a different nature than the one proposed in this work; one they may wish to label "non linguistic" [95, p.197]:

A judgement as to what the speaker is trying to do in a discourse will influence the interpretation of what he or she says. ... This kind of relevance, then, would be most insightfully considered not as some kind of semantic entailment relation between sentences but as relations of purpose between speech acts, relative to some goal.

Lacking even a partially explicit theory of plans, actions, and inference in which to state such hypotheses, though, our proposals are little more than speculation. But we think this line of research is more likely to bear fruit than that of constructing ever more exotic linguistic units and levels and accounts of discourse comprehension.

I agree that "relations of purpose between speech acts relative to some goal" are governing criteria of discourse relevance. However, as noted earlier, I believe, such "relations of purpose" should be thought of as communicative goals rather than underlying psychological motivations. Mere psychological motivations are not sufficient, though, they are important and are often reflected in the communicative goal attempted. A communicative goal is a distinct "level of purpose" (specific to discourse engagement) which functionally relates a speaker's utterances to the preceding discourse flow and its resulting structure.

To claim that psychological motivation alone suffices and that linguistic units - such as the notion of a context space - are excess and nonproductive tools of analysis, is in my mind merely to ignore the manifold linguistic evidence for these units in discourse. Psychological motivation per se does not lend coherence to discourse. A speaker's psychological goal could be to "be incoherent," "confuse the listener," etc. Would this make her/his utterances coherent?

Morgan's&Sellner's diametric opposition between a speech act theory of

discourse and a linguistic structural one is a red herring. Clearly, both types of analysis are relevant and necessary for a full analysis of the dynamic and complex communicative process of discourse engagement. The context space theory of discourse can encompass both.

9.1.2 A fixed meaning in text?

Due to historical reasons, a linguistic/structural approach is often thought of as being in direct opposition to a motivational, situational, or knowledge oriented endeavor. As I have stated earlier, the abstract context space approach, though proposing a set of "grammatical" discourse rules for "well formed discourse," does not support such a position. In the grammar I have characterized one set of rules operative in discourse. In discussing the component features of the grammar in Chapter 2, I explicitly stated that there were orthogonal rules operative in discourse processing. For example, I mentioned such things as "social-peer relationships," "the aggressive-meekish" nature of a speaker, etc. From the onset of its design, this grammar has been developed with the intention of a subsequent "hook-up" to other discourse modules.

For example, many of the grammar's transition arcs specify possible choice paths "appropriate" in a given context. It is clear that a second mechanism, more sensitive to psychological motivation and/or the situational context, would decide which one of these paths to choose [e.g., 120, 121]. I stress, therefore, that these other criteria should be thought of as occurring with, rather than, in place of, a more structural approach (and conversely, my work should be thought of as operating together with such a psychological model). As I discuss in further detail in Chapters 10 & 11, there are already some seemingly clear points at which these different modules can be integrated.

Another common view of a structural approach to text linguistics is a notion of "the meaning is in the text." Consider, for example, Goetz&Ambruster's remarks below [42, p.214]:

A common feature of the discourse structure analyses to date is that text structure is treated as though it were an inherent, immutable attribute of the text, interpreted in the same manner by all readers. Thus, the importance of an element of text is determined by the position of that element in the structure of the text. ... An alternative position is the constructivist view outlined by Spiro. In the constructivist view, the emphasis shifts from the structure of text as an independent, immutable entity to structure and meaning as imposed on the text by the reader.

The context space theory presented in this thesis, though structural in nature, is not a proponent of what is commonly thought of by this notion of "fixed meaning in text." As Spiro notes, the fixed-meaning view does not allow for inferential elaborations as part of the process of comprehending prose; nor does it allow for contextual and functional derivations.

As amply illustrated in this thesis, the context space grammar stresses that inferential components of a move are as important as components verbally expressed. This importance is captured by the grammar's characterization of types of context spaces, which are often distinguished by slots particular to implicit components of the corresponding conversational move.

In addition, the grammar's notion of "meaning" is highly contextually and functionally determined. For example, Brewer commenting on the following set of utterances, "Jack made out his will. He slipped on his 'New York is fun city' T-shirt. He gathered up his roll of wire. Then he got into the car and drove south. He got out and took the elevator," states [14, p.228]:

Although this is a fairly coherent piece of narrative discourse, it is a lousy story. It does not build up to a climax. It does not seem to have a natural ending. It does not seem to have a point.

The context space theory would not even find the text coherent - precisely because it lacks a point. As I have illustrated throughout the thesis, function and structure are not in opposition. On the contrary, communicative goal functionality determines the discourse structure!

The real contention between a context space theory of discourse and a general belief-world knowledge approach, can be summarized, I believe, with the following:

The Context Space Theory: The discourse flow and a speaker's surface forms greatly constrain and predict functional discernment and interpretation. There are discourse specific rules for maxim-abiding speech (in addition to the legitimate roles of world knowledge and inferences of speaker intent).

The World Knowledge View: General rules of how the world works and particular beliefs about the psychological state of the person with whom we are conversing are the only or major features enabling discourse engagement.

The ironic aspects of this seeming opposed "constructivist" view is that its proponents (e.g., [129, 42]) present studies such as those of Lachman&Dooling's [81] and Bransford&Johnson's [13] which show that depending on "context" - such as preceding titles - a listener will interpret a piece of text quite differently. But, this is precisely why the context space theory was constructed - to enable identification of that preceding section of discourse providing the speaker and listener the discourse environment in which to "connect something that is given with something other than itself" [7].

Proponents of the world knowledge view also present the Anderson&Pichert study, wherein subjects are asked to rate the importance of a story's idea units from the perspective of a home buyer versus a burglar, where, some parts of the story would be of more "interest" to home buyers, while others would be of more interest to burglars [3]. The study showed that depending on perspective assigned, the subjects rated different parts of the story as more important than others. In assessment of the studies, Goetz&Ambruster state (p. 215):

If importance is indeed an inherent aspect of text, as implied by existing text analysis systems, then assigned perspective should have no effect on rated importance.

Once again, if this same piece of text were actually uttered in discourse, it would have been stated in some surrounding discourse context. This discourse

context, itself, would have specified this perspective imposed in the laboratory and similarly would have led listeners within the communicative context to identify different elements as major⁸².

In addition, it is important to recognize that the grammar does not dictate a single, particular interpretation for a set of utterances. As described, its rules of generation/interpretation, in essence, correspond to function calls to procedures capable of accessing world beliefs, a lexicon of the language, and beliefs about social norms of behavior. Interpretation is not fixed.

For example, since in our society aggressiveness is often considered a negative attribute diametrically opposed to one's being nice, the grammar, using as its world knowledge component the norms of our society, would interpret the illocutionary force of B's utterance (below) as a challenge.

A: I think Susan is a wonderfully nice person.

B: I think she's very aggressive.

On the other hand, the grammar using a world knowledge component of another society, could conceivably interpret B's utterance as a support. The meaning, or illocutionary force of an utterance clearly depends both on context identification and world knowledge beliefs.

Lest, however, I leave the reader with the impression that in essence semantic interpretation and goal identification is arbitrarily contingent upon a particular listener's mental model of the world, I must restate that in the body of this thesis I have listed many rules particular to speaker goal identification that in a sense are not open to arbitrary assessment on the part of a listener. That is, assuming the hearer is a competent speaker of the language, a speaker's:

⁸²Of more interest, in the retelling of a story, usually, only those events and orientation pieces needed for the story to fulfill a single communicative goal are stated. It is therefore even unclear to me whether such a neutrally biased story, serving two separate perspectives, would occur in discourse without some extra structuring devices - e.g., an "Incidentally" subspace.

- o repeated nonpronominalization of an entity under discussion;
- o nonpronominalization to an entity just referenced pronominally;
- o use of such clue words as "It's like," "Incidentally," "But, anyway," etc.

must convey to the listener certain structural attributes of the discourse, and aspects of the force and underlying point of the speaker's utterances.

Bolt Beranek and Newman Inc.

Report No. 4681

10. COMPARISON WITH OTHER WORKS

In this chapter, I present brief overviews of a number of different approaches taken to text analysis. The main thrust of discussion will be to highlight points of overlap, contention, and possible integration, between these different works and the context space theory approach. In addition, for many of the works, I shall illustrate that as in the context-space endeavor, there is a high correlation between a researcher's claims and results and the researcher's view of a text/discourse's structure.

10.1 Communicative goals and speaker intent

As described in Chapter 9, the context space theory distinguishes between the "communicative goal" reflected in a speaker's utterances and her/his psychological intent for saying what s/he does. In the following, I shall briefly review a number of works which do not make this distinction and whose interpretation of the force of a speaker's utterances stems mainly from inferring a speaker's underlying intent, plans, and personal beliefs. The main thrust of my discussion will be to illustrate that the two approaches (with some reservations) are basically orthogonal in nature, and that rather than being in opposition, the approaches can be integrated to yield a single, more complete, and satisfying theory of discourse.

10.1.1 World knowledge - speaker intent approaches

A number of works on communication have made the speech act theory à la Austin, Searle, and Grice, their cornerstone of analysis [e.g., 2, 16, 24, 27, 34, 78, 107, 108, 128, 139, 99]. Many of these works, like that of the founding fathers, emphasize the sincerity condition

and access to a speaker's psychological state as fundamental elements of analysis. The works attribute specific goals, plans, and beliefs to speakers, and it is in terms of such psychological motivations and references to an external state of affairs, that their discourse analysis proceeds. For example, consider Allen's analysis of the "Inform Act" [2].

INFORM(speaker, hearer, P): P is a proposition

precondition	speaker KNOW P (==P and speaker Believe P)
effect	hearer KNOW P
body	hearer BELIEVE speaker WANT(hearer KNOW P)

Making use of such rules, Allen's system models a person B responding to a speaker A's request for information, by having B infer that A wants to know the information, which can be accomplished if B informs A of the information, which thereby means that B infers that A wants B to inform A of the information. In addition, in order for B to "appropriately" respond, B has to infer some plan of A's that would require A to have this information. For example, a user asking the Allen system the departure time of a train, will also get the departure gate number of the train, since the system will infer that the user needs the time information in order to meet or take this train - to do so requires that the user not only know the time of departure but the gate number as well.

Labov&Fanshel's work on therapeutic discourse [78] similarly derives its method of analysis from the speech act theory's notion of preconditions and effects formulated in terms of psychological mental states, the role status of persons involved in the interchange, and the social organization of the "real" world via its rights and obligations. For example, using the "Challenge" speech act rule stated below, Labov&Fanshel analyze a child's questioning when her mother plans to return from a prolonged absence, as a challenge to her mother's competence in the mother role (p. 161).

If A makes a request for B to take an action in role R, based on needs, abilities, obligations, and rights which have been valid for some time, then A is heard as criticizing B's competence in role R.

10.1.2 The contrastive view

In one light, one could say that the context space and speaker intent theories are in conflict with one another. For example, let's consider the seeming opposed versions of analysis the two approaches would take to interpret a speaker's utterance of "It's cold in here," as a request for a listener to "Open a closed window."

In Allen's system (described above), the following set of inferences about the speaker's psychological state would be made:

(1) the speaker wants me to know that s/he is cold; (2) and since s/he knows that I know that being cold is undesirable; (3) s/he intends me to infer that s/he does not want to be cold. Furthermore, (4) since s/he knows that I know that the open window is causing him/her to be cold; (5) s/he expects and intends me to close the window. Therefore, I take the utterance as a request.

In contrast, one possible way for the context space theory to derive the force of the utterance as a request, is for it to formulate a conversational move corresponding to a speaker's communicative goal of requesting performance of an action: one mode for fulfilling such a goal would be for a speaker to state a "negative state-of-affairs" which could be altered if this action were performed.

Under the context space paradigm, then, listeners can simply access conventionalized discourse rules to determine the force of such indirect requests⁸³. A listener's ability to infer a probable underlying speaker intent for an utterance, is similarly easily explained: s/he uses introspective knowledge of the obvious correlation between conventionalized

⁸³A la Bennett's notion of "dullard" operation: "Hear S, infer P, purely through the generalization that when S is uttered P is true" [9, p.195]. Bennett, however, committed to retaining some form of the Gricean conditions in utterance generation/interpretation, claims that people do not really function as dullards, they just believe that everyone else does. Using such an analysis, he posits a set of "Sub-Gricean" conditions.

forms of intent communication and communicative goal generation (which s/he assumes is a shared convention among all participants in the language community).

10.1.3 An integrated approach

Notice, however, that in the above, even the context space theory must somehow be able to ascertain that the utterance "It's cold in here" specifies a "negative state of affairs." More importantly, a given individual using a context space grammar to drive his/her analysis, must surely, at the same time, be able to ensure that there are no specific contradictory beliefs about this speaker that would warrant rejection of the conventional force of an utterance⁸⁴ (e.g., it might be known that the particular speaker who said "It's cold in here," loves the cold, and though for others the utterance would be a negative assertion, for this particular speaker it is a positive one).

As in Allen's system, many speech act approaches focus on inferring/generating underlying speaker plans [16, 25, 107]. Now, it's clear that given some plan, a speaker's utterances will often reflect this plan. This simply follows from the fact that our utterances usually reflect what we're thinking about.⁸⁵ Of more interest, however, is how a speaker's structuring of his/her plans is reflected in the speaker's choice of surface linguistic forms to describe the plans. I would claim that, in fact, there is

⁸⁴Similar to Scribner's [123] claim that empirical biases enter a problem solution process as a "selector" and "editor" of the evidence. That is, a possible solution is first generated via general rules of inference, and then is later possibly rejected due to some specific world knowledge beliefs.

⁸⁵Bruce, analyzing fox-like children's fables, adds an interesting twist to plan analysis by focusing on situations wherein a speaker purposefully hides his underlying intent from co-participants in the situation.

AD-A103 566

BOLT BERANEK AND NEWMAN INC CAMBRIDGE MA

F/6 5/7

PLAIN SPEAKING: A THEORY AND GRAMMAR OF SPONTANEOUS DISCOURSE. (U)

N00014-77-C-0371

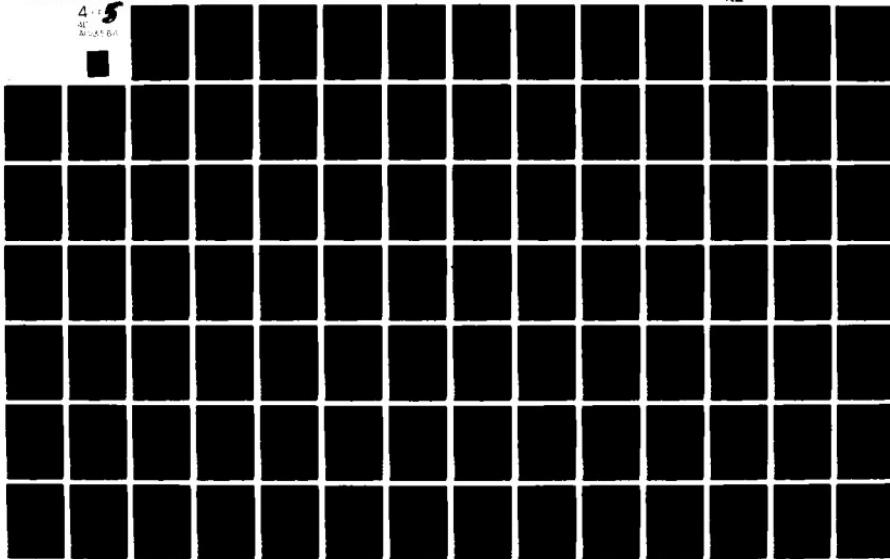
JUN 81 R REICHMAN

NL

UNCLASSIFIED

BBN-4681

4-
41
41-51 61



a high correlation between a speaker's structuring of his/her discourse context space structures - as reflected in his/her surface linguistic forms like "Now," "By the way," etc. - and his/her current structuring of the component actions involved in an underlying plan of action.

Recent goal/plan oriented systems take no notice of such surface linguistic phenomena - plan recognition drives linguistic interpretation and not vice versa. At minimum, I believe, some bi-directional system is warranted. For example, by being sensitive to a clue word like "Now," these systems could reasonably infer that a speaker is continuing to develop the same plan posited for her/his earlier utterances; given the clue word "Anyway," on the other hand, these systems should recognize that, in all probability, the listener is leaving investigation of a current plan and returning to one s/he had earlier left unfinished.

Another feature of overlap and integration that could be made between these two approaches, is the issue of "mutual belief." In particular, as noted earlier, in this construction of the grammar, there is only a single discourse model being built. It's clear, however, that each participant builds her or his own model of the discourse. To include a notion of mutual belief, we could posit that a component of one conversant's discourse model is a model of his/her co-participant's model; where both models would be derived from the single set of maxim-abiding discourse rules posited in this thesis.

My own belief, however, is that individuals do not construct (carry around) explicit models of their co-participants' model of the discourse, and that preconditions of mutual belief models is too strong to account for the data found in an analysis of ongoing discourse. However, it is clear that some sensitivity to the discourse models of others, and comparisons between them and one's own, is a required feature for maxim-abiding discourse. I briefly illustrate this point below.

As noted in the earlier discussion of Excerpt 14, Chapter 5, Excerpt 14 illustrates a situation wherein two conversants seem to have differing models of the discourse: Speaker G, for example, seems to have her mother in focus; speaker B, on the other hand, seems to have left her focus on G's father.

And, in this piece of dialogue, we find the conversants' using their own individual discourse models to guide their choices of surface linguistic referring expressions (e.g., B pronominalizes her reference to G's father, since in her model, he is still in focus; G, on the other hand, follows B's pronominal reference with a full descriptor expression, since, in her model, her father is not in focus). A number of issues relating to mutual beliefs are, however, raised by this example:

(1) Is B's pronominal reference "legal?" (2) If in B's model G's father is in focus ("legalizing" her pronominal reference), where/how has B integrated into her model G's succeeding utterances which clearly have G's mother in focus, rather than G's father? And (3) is G's nonpronominal reference mandatory? i.e., would we not find speakers automatically updating their models based on a co-conversant's switch in focus?

In the current prototype context space grammar design, the issues raised in the above are not addressed. Incorporating some appropriate version of a speech-act system into a context space theory approach, I believe, could lead to fruitful resolution and compromise on such questions.

10.2 Discourse-Genre specialization

As discussed in Chapter 8, there is a school of text/discourse analysis which is based on characterizing and differentiating between different discourse forms. Each such categorized form is considered a distinct, separate discourse "genre" or "schemata." The roots of this characterization school can be laid to Propp, a researcher of Russian folklore, and to Hymes, a sociologist. In an effort to identify the correlations between social variation and discourse form, Hymes uses distinction as a prime methodological tool to categorize different types of genres [65, 66].

The list of identified discourse genres/schematas is quite extensive and varied. This is due to the fact that a researcher's identification and characterization of a discourse genre is mainly dependent on the particular

parameters that s/he chooses as criteria of categorization. The following are but some of the discourse genres noted in the literature:

"poetic/literary text," "text of persuasion," "text of narration," "text of literary scholarship," "procedural discourse," "behavioral discourse," "drama," "fiction," "poetry," "greetings," "riddles," "jokes," and/or "logical genre."

Similarly, the list of researchers who make extensive use of genre/schemata classification in their work is quite long. To name but a few: Longrace [87], Levinsohn [82], Hymes [65, 66], Propp [110], Rumelhart [114], Prince [109], van Dijk [135], Hasan [60], and Brewer [14]. In the following, I shall give a brief overview of Hasan's and Rumelhart's respective approaches to (and uses of) genre classification.

Hasan uses "extra-linguistic" situational concerns to characterize different discourse types. Using Halliday's notion of "field," "tenor," and "mode" [52], Hasan creates a "contextual construct" [58, 59], which he claims creates the "contextual configuration" (CC) by which one can distinguish discourse genres. For example, the following CC distinguishes the "professional consultation, client, telephone" genre [60, p.231]:

field

professional consultation: medical;
application for appointment ...

tenor

client: patient-applicant,
agent for consultant: receptionist;
maxim social distance ...

mode

aural channel: -visual contact: telephone conversation;
spoken medium ...

According to Hasan, the values in a CC determine "what elements may occur in what configuration" (p. 233). The following constituents, for example, belong to the CC described above.

Obligatory Elements:

Identification (I);
Application(A);
Offer (O);
Confirmation (C).

Optional Elements:

Greeting (G);
Query (Q);
Documentation (D);
Summary (S);
Finis (F).

In illustration of this CC, Hasan presents the following text and accompanying "structural" description (p. 234).

- Good morning (G) Dr. Scott's clinic (I) may I help you (Q)
- Oh hello good morning (G) this is Mrs Lee speaking (I) I wonder if I could see Dr Scott today(A)
- um well let me see I'm afraid Mrs lee I don't have much choice of time today would 6:15 this evening suit you (O)
- yes, yes, that'll be fine
- may I have your address and phone number please (D)
- 24 May Avenue, North Clyde and the number is 527.2755 (D)
- thank you (D) so that's Mrs Lee for Dr Scott at 6:15 this evening (S)
- mm yes thanks (F)
- thank you (F)

Rumelhart, on the other hand, does not base his characterization on such external situational criteria. His work in genre/schemata classification stems more directly from Propp's work on the "structure" of Russian folklore. Using Propp's analysis, and much of classical, Chomskian-like linguistics, Rumelhart proposes the notion of a "story grammar" [114]. Story grammars, like traditional Katz&Fodor grammars (or for that matter, Montague-like grammars [94]), have two sets of rules: (1) phrase structure syntactic rules, and (2) semantic rules. The following exemplifies Rumelhart's story grammar.

Syntactic Rules:

Rule 1: Story -> Setting + Episode
Rule 2: Setting -> (State)*
Rule 3: Episode -> Event + Reaction

Semantic Rules:

Rule 1': Allow(Setting, Episode)
Rule 2': And(State, State ...)
Rule 3': Initiate(Event, Reaction)

While the foundations and criteria of parameterization of the two works cited above are clearly quite different, their common goals and points of analyses are markedly similar. To begin, both purport to be studying a discourse's structure, and both assume that identification of such a structure lies in characterizing a linear, sequential, and fixed-order for component constituents of this structure.

Let me compare these works to the context space approach. It is true that in the discourse ATN presented in this thesis, certain constituents of a discourse are identified based on a "thematic" connection between constituent parts. However, the context space theory does not support an a priori linear characterization of where these thematically related constituents will appear in a given discourse.

In contrast to the context space approach, Rumelhart's and Hasan's fixed linear characterizations leave no room for the ever frequent discourse occurrences of context space suspensions and resumptions; they neglect the importance of discourse flexibility [43]. For example, there is no accommodation for interruption suspensions with subsequent returns; no accommodation for a closing suspension with a subsequent re-opening; no accommodation for an analogy suspension with an accompanying resumption of the initiating subject of the analogy; and there is no room for development of a second subordinate constituent which does not relate to the last preceding constituent (as much as it does to an earlier superordinate one).

In addition, as stressed throughout the thesis, "structure" and "cohesion" do not depend solely on semantic/logical relations between events

in the real world. For example, as noted earlier, though two events may have occurred in a single episode, it does not follow that they, therefore, both warrant mention in the telling of a story in a given discourse context. And, even if both events are mentioned, it does not then necessarily follow that they will be partitioned into a same context space. As emphasized throughout the thesis, it is the communicative goal of the story-telling that mainly determines what goes where.

It is therefore important to recognize that though both Rumelhart and myself speak of our respective works as "grammars," our works are radically different and distinct when it comes to issues like: (1) how a grammar must be written; (2) what constitutes a discourse "structure," and (3) what constitutes "maxim-abiding" development of a discourse.

As discussed in Chapter 8, the most disturbing aspect of genre-specialization work is the noncharacterization of the sense of structure that these works address. Specifically, as illustrated in the above examples, the genre-sense of structure is intricately interwoven with the "content" of discussion, and is properly labelled "textual schemata" (as discussed in Chapter 8). In the main, genre-analyses do not recognize the Abstract-Context-Space schemata which underlies all discourse forms. And, as such, they rarely delineate the many shared features and rules governing all discourse forms. In my opinion, the claim that "different genres have different structures," at best, should be replaced with "different genres, usually, have different thematic developments."

10.3 The Ethnomethodologists

At the conceptual level, both in methodology and philosophical assumptions, a school of thought seemingly closer to the context space approach is that of the Ethnomethodologists. Like in the context space theory, the ethnomethodologists analyze freely occurring discourses, and their main goal is to explicate the many discourse rules and features common to all

forms of effective maxim-abiding oral communication. For example, as noted by Sacks, Schegloff, and Jefferson [116]:

Since conversation can accommodate a wide range of situations, since it is a vehicle for interactions in which persons in varieties of identities and varieties of groups of identities are operating, since it is sensitive to the various combinations, and since it is capable of dealing with a change of situation within a situation, there must be some formal apparatus which is itself context-free, that by virtue of the ways in which it is context-free can in local instance of its operations be sensitive to, and exhibit its sensitivity to, various of the parameters of social reality in a local context.

In addition, ethnomethodologists are primarily concerned with providing a methodology/machinery that can delineate an individual's process of interpretation, without having to claim that only this interpretation of the utterance is viable [145]. This is contrastive with many other approaches to text (including some speech act theory approaches) where a fixed coding scheme is often sought. As discussed in Chapter 9, the context space approach does not, in principle, espouse fixed coding schemes.

Given that the ethnomethodological approach is so similar to the context space theory's approach, one would probably expect to find many overlaps in analysis. While there are some overlaps, in the main, the two approaches do not converge. Below, I shall attempt to highlight major features of the ethnomethodological results and compare and contrast them with results of the context space theory.

Searching for underlying, common, context/situational free rules/phenomena of discourse, the ethnomethodological school begins its analysis with rules for "turn-taking." Why they do so should be clear - turn-taking obviously occurs in all conversations, no matter what the subject, or who the participants. Focusing on this content-free feature of discourse, Sacks, Schegloff, and Jefferson identify operational rules of transfer like "current speaker selects next," and they address issues like [116]:

That is, that the interutterance pauses are very brief shows that

one regularly starts fast; and the "single" starter should be thought of as "first starter," succeeding in being single starter because of the "first starter goes" provision, and being "dispensable" in that had he not started and started fast, someone else would have.

In identifying "legal" points of transfer, and in delineating the relation between a preceding and succeeding turn, the ethnomethodologists turn to a notion of adjacency pair and/or consecutive pairs⁸⁶. An adjacency pair, the ethnomethodologists claim, is a major feature of discourse organization. On one speaker's turn, a speaker utters the first part of an adjacency pair, on the next turn, a second speaker utters the second part of the adjacency pair. The following are typical of the types of adjacency pairs that the ethnomethodologists have in mind:

- o greeting/greeting; offer/acceptance or refusal; question/answer; confirmation-request/confirmation.

Notice that not only is identification of adjacency pairs a natural extension of turn-taking in the manner described above (i.e., as a means of accounting for what goes on in these turns), but, in addition, it naturally follows the linear, sequential, temporal view of discourse focused on in a notion like turn-taking. Adjacency pairs, like turn-taking, emphasizes the superficial linear, temporal organizational features of discourse, i.e., first pair parts temporally precede second pair parts; second pair parts temporally follow first pair parts. Adjacency pairs is the main feature of ethnomethodological work on "preceding discourse context constraining and predicting succeeding conversational development."

The above two features of ethnomethodological discourse analysis are clearly not major features of the context space theory. Unlike the ethnomethodologists, the context space theory stresses the recurrence and

⁸⁶Consecutive pairs are distinct from adjacency pairs mainly in that they are embedded in some prior larger structure - like a preceding first pair part of an adjacency pair [69].

frequency of conversational moves necessitating "discourse popping," stressing a discourse's "deep structure" which is mainly non-linear and non-sequential in form.

The works begin to approach each other mainly when the ethnomethodologists discuss "seeming violations" of turn-taking, adjacency pairs, and the sequential organization of discourse. But, even here, the works do not really complement each other as the ethnomethodologists continue to emphasize "discourse placement" in their analysis. For example, in the context space theory, an interruption (with its associated markers like, "Incidentally," and "By the way,") is but one form of conversational move that can occur anywhere in a discourse. In contrast, Sacks and Schegloff [130], discussing such "misplacement markers," claim:

Misplacement markers, thus, display an orientation by their user to the proper sequential-organization character of a particular place in a conversation.

Their examples of interruption concern "an utterance inserted after a question has been asked but before it has been answered,"⁸⁷ and/or introduction of a new topic of discourse in the "closing section of talk"⁸⁸.

A second example of seeming correspondence occurs when Sacks notes that certain ordinary rules of discourse, like turn-taking, are suspended during development of such discourse units as "stories," "riddles," and "jokes:" a

⁸⁷ Hein inter-relates "interruptions" with "speaker turn-taking" rules, and distinguishes between "self interruptions" and "auditor interruptions" [61]. Hein's interruption-analysis focuses, in the main, on mid-utterance interruptions occurring for purposes of local clarification. His work not does address "midstream global topic shifts," which necessitate rules for context space suspension and resumption.

⁸⁸ Jefferson, however, does recognize and focus on the fact that "off track development" can occur anywhere in a discourse, and she discusses speakers' surface linguistic forms signalling and/or excusing this (such as use vs nonuse of repetition in a story's preface) [68].

single speaker may retain the floor until the end of her/his story, riddle, or joke. In contrast, since the context space theory's analysis does not rest on turn-taking, and it does not view a conversation primarily as a linear sequence of utterances, but rather as a forum for the functional development/fulfillment of speaker communicative goals, it does not have to view a speaker holding the floor for longer than a single utterance as an exception to some rule. A speaker "legitimately" holds a turn as long as it takes to fulfill a single communicative goal. A speaker tells a story in the discourse to fulfill some communicative goal; s/he, therefore, naturally retains the floor.

In addition, we need a somewhat more complex notion of a discourse unit based on communicative functionality in order to appropriately model when and where speakers are likely to retain their turns for longer than a single utterance. A discourse unit is not simply composed of a set of utterances referring to a set of events of a single time period which lead to a climax and/or punch-line event. Discourse units are complex structures; they themselves have subconstituents; each with its own own culminating event, punch line, or the like. Thus, for example, in the context space theory, the assertion of a claim and presentation of two separate narrative supports for the claim results in development of a single discourse unit (albeit the unit is composed of sub-units): the claim and its supports serve a single communicative goal of a speaker.

The ethnomethodologists' current formulation of the turn-taking suspension rule provides no account of why it is appropriate for speakers to legitimately hold the floor during development of this form of single complex discourse unit. There are clearly other contexts, for example, where "speaker selects him/herself as next speaker" leads to inappropriate and noneffective communication. In addition, the ethnomethodologists' notion of adjacency pairs cannot account for the fact that in this unit, the second story is a functional development of the initial claim being supported and not of its immediate sequential predecessor, the first story.

Let me now turn to a different school of thought, the "Tagmemic"

theorists, whose approach to discourse structure is somewhat closer to that of the context space theory approach.

10.4 The Tagmemic school

Unlike the Ethnomethodologists, or the context space theory approach, the Tagmemic school begins its analysis by distinguishing between different discourse forms. Despite this difference between the context space approach and the Tagmemicists, there are some close correlations between the Tagmemic results and those presented in this work.

According to proponents of the Tagmemic school (e.g., Pike [104], Longrace [87] and Levinsohn [82]) discourse, like single sentences, should be thought of having some underlying "deep structure." This deep structure, is an organization of discourse constituents and subconstituents. Each constituent, is identified by "slots" normally associated with its presence.

In the main, the Tagmemic school's notion of a constituent-subconstituent deep structure representation of a discourse is basically the "textual schemata" structure discussed earlier (i.e., a linear representation of thematically related constituents of particular discourse forms). For example, like current "story grammar analyses" (*à la* Rumelhart [114] and Prince [109]), the Tagmemicists identify a "narrative genre," composed of the following slots: aperture, stage, pre-peak episode, peak, post-peak episode, closure, and finis (where aperture and finis are in some sense outside the boundaries of the actual episode). Their approach, however, is slightly more functional than common notions of story grammars, in that, like Propp [110], they recognize the importance of climax and resolution in a story. This is reflected in their analysis by the narrative genre being +tension - the story, to be a story, must have a climactic event.

The Tagmemicists also attempt to identify some surface level "cohesion" devices operative in all forms of discourse. Many of these "ties," however, seem to be ordinary artifacts of the content of a current discussion. For

example, Longrace & Levinsohn [88] cite "lexical ties and paraphrase" as one form of surface structure cohesive device. In exemplification they present sequences like, "He shot him and he died." As Morgan&Sellner would claim, considering such sequences as illustrating linguistic cohesion devices is highly misleading, as they are but epiphenomena of one's discussing a given topic of discourse.

Despite these differences, some aspects of the Tagmemic school are closer to this analysis than that encaptured by most other "textual schemata" approaches. For example, Longrace&Levinsohn's list of structural cohesive devices does include some items that cannot be attributed merely to the content of discourse. In particular, as noted in my earlier discussion of discourse reference (cf., in Chapter 5), they discuss the fact that certain particle and affix markers are used in the Cubeo language to distinguish a story's main character from its other protagonists. In addition, Longrace&Levinsohn speculate that there is some correlation between deictic references and "paragraph breaks." For example, they have noticed that "the use of the demonstrative "chi" (that) in Inga, to modify references to participants, partially corresponds with a new paragraph" (p. 121). These aspects of cohesion do complement the context space's "cohesion rules" that some reference forms can only be used for discourse entities in high focus and/or in the current relevant discourse context.

In addition, though not actually representing a developed theory of discourse popping, Longrace&Levinsohn recognize that pure linearity does not govern thematic development. For example, in considering the following set of sentences:

1. So the mother-in-law went ahead, weeping, to where she had buried the piece of wild papaya. 2. On arriving, she said, "Here is where he is buried." 3. Having said that, she fled a little way off and hanged herself.

4. The father dug into the grave, and on removing the earth, found just a piece of wild papaya. 6. "Oh, no!" he said. "I'm going to find out what really happened."

So saying, he followed her footprints. 8. and found her; 9. she was hanging, having strangled herself.

Longrace&Levinsohn note (p. 115):

The actions of sentence 4 do follow not from that of 3, but of 2; the father dug in response to the mother-in-law's words, not her hanging herself.

Thus, though the Tagmemic school's analysis of discourse does not reach the level of discourse analysis undertaken here (i.e., they do not identify the Abstract-Context-Space schemata), their work is clearly closer in form than that of the ethnomethodological work described above, and/or some other works on textual schemata.

10.5 The Functional-Sentence-Perspective approach

The "Functional Sentence Perspective" (FSP) [33, 53] and/or "Communicative Dynamism" (CD) [37] school of thought, is another major approach taken to text/discourse analysis. The FSP and CD approaches emanate from Marthusies's early work in the Prague school, and, in the main, rest on distinguishing between the "theme" and "rheme" of an utterance. The theme of an utterances, usually called the "old" or "given" information, is what the sentence is all about, the rheme of the utterance, usually called the "new" information, is what is being added or predicated about this known information. A theme-rheme distinction is usually based on the claim that the theme of a sentence precedes its rheme.

While most of the work in FSP centers on the analysis of single sentences, these approaches, at times, address themselves to more extended discourse. In a recent article, for example, Palková&Palek (from the Prague school) illustrate how a theme-rheme distinction can be used to explain how and why certain "fronting" operations are more appropriate in one discourse context than another [103]. A more comprehensive endeavor towards extended text/discourse analysis by a proponent of the FSP approach is presented in Halliday&Hasan's well known work, Cohesion in English [54].

Halliday&Hasan posit three separate elements of text analysis: (1) the texture within a sentence; (2) the texture of the whole discourse; and (3) the structure of this discourse. By texture within the sentence, Halliday&Hasan refer to the structural decomposition of a sentence into its theme and rheme; by texture of the discourse, they refer to a set of linguistic "cohesive ties," which they claim reflect the "hangingness together of a text;" and by structure, they mainly refer to the ethnomethodological work described above and notions like "textual schemata." In discussion below, we will see how Halliday&Hasan's divorce of text structure from "texture," and their mainly linear view of a discourse's structure, explains and correlates itself with many of their results.

Cohesion, according to Halliday&Hasan, "occurs where the interpretation of some element in the discourse is dependent on that of another" (p. 4). Cohesion, they claim, is the underlying element of text that makes it "hang together as a text." Halliday&Hasan identify five major cohesive devices underlying "cohesive text production."

1. Reference
2. Substitution
3. Ellipsis
4. Conjunction
5. Lexical Cohesion

And, in their book, they present the following examples of such cohesive ties in text:

1. Reference:

A: Wash and core six cooking apples.
Put them into a fireproof pan.

2. Substitution:

B: I shoot the hippopotamus with bullets made of platinum.
Because if I use leaden ones his hide is sure to flatten
them.

3. Ellipsis:

C: Does Jane sing?

Yes, she does. (SING)

4. Conjunction:

D: My client says he does not know this witness.
Further he denies ever having seen her or spoken to her.

E: "You'll find yourself in the Fourth Square in no time.
Well, that square belongs to Tweedledum and Tweedledee
the Fifth is mostly water - the Sixth belongs to Humpty Dumpty - But you make no remark?

5. Lexical Cohesion:

F: Well, I'll eat it," said Alice, "and if it makes larger, I can reach the key; and if it makes me smaller, I can creep under the door."

(larger - smaller; key - door)

It is sufficient to point to examples like the above, which proliferate Halliday&Hasan's book on cohesion, to make the point that Halliday&Hasan's notion of "cohesion" and surface linguistic phenomena reflecting such "cohesion," are radically different than those based on a hierarchical organization of discourse utterances. More importantly, however, much of their analysis is simply wrong.

That similar words appear in a given stretch of discourse is a mere artifact of the content of discussion. Thus, Halliday&Hasan's notion of lexical cohesion, like that of Longrace&Levinsohn's, is somewhat vacuous. In addition, however, their notion of lexical cohesion is highly misleading, and can lead to a false analysis of a piece of text. For example, consider the following text presented in the introduction of Grosz's thesis [49]:

- P1: I'm going camping next week-end. Do you have a two person tent I could borrow?
P2: Sure. I have a two-person backpacking tent.
P1: The last trip I was on there was a huge storm. It poured for two hours. I had a tent but I got soaked anyway.
P2: What kind of tent was it?
P1: A tube tent.
P2: Tube tents don't stand up well in a real storm.
P1: True.

P2: Where are you going on this trip?
P1: Up in the Minarets.
P2: Do you need any other equipment?
P1: No.
P2: Ok. I'll bring the tent in tomorrow.

As Grosz notes, the referent of the tent in P2's last utterance is the one that s/he owns and intends to lend to P1; it is not the tent owned by P1 which was the one last mentioned before P2's utterance. Grosz explains this by noting that the two tents lie in separate "focus spaces," the second space being a subordinate of the first. By the time of P2's last utterance, only the superordinate space containing mention of the tent that P2 owns is in focus; hence, it is the only available referent in the current discourse context.

However, according to Halliday&Hasan's linear view of a discourse structure, such a hierarchical partitioning of the discourse cannot be recognized, and hence, according to their analysis, the connection between all occurrences of "tent," in the above text, are equivalent.

In addition, as illustrated in the body of this thesis, nonpronominalization, rather than pronominalization, is a major linguistic device that reflects a discourse's structure, cohesion, and texture. Halliday&Hasan's example of pronominalization in text is basically no different than ordinary pronominalization found within the single utterance. Their claim that it is the use of a pronoun which gives "cohesion" to the "wash and core apples" text is absurd. As Morgan&Sellner claim, these utterances are coherent and hang together, not because the pronoun "them" is used, but rather, because they describe a coherent set of cooking instructions.

I must conclude, therefore, that despite its length and volume, Cohesion in English does not significantly address the issue of "coherence"/"cohesion" in extended discourse.

There is, however, one more work in the FSP school, which, I believe, warrants mention: Danes' work on "thematic progression" [33]. Danes, basing

his analysis on the theme-rheme distinction, posits that the following three progressions account for most (much/all) of discourse development:

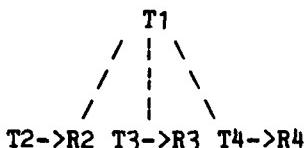
1. Make the old rheme the new theme:

$$\begin{array}{l} T1 \rightarrow R1 \\ | \\ T2 (= R1) \rightarrow R2 \end{array}$$

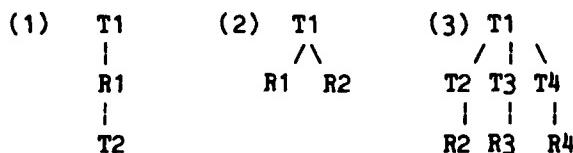
2. Give a new rheme to the preceding theme:

$$\begin{array}{l} T1 \rightarrow R1 \\ T1 \rightarrow R2 \end{array}$$

3. Discuss a new rheme and theme pair which stand in the same relation to some preceding higher level theme that a preceding theme-rheme pair do.



Though Dane's interpretation of the above is meant quite literally - for example, in (1) T2 is identical to R1; in (2) the second T1 is a literal remention of the first, etc., - I believe, taken at a more abstract level, his work does begin to address and lay down fundamentals of text structure. To see this, let's re-represent the three figures above as:



Now, if we do not limit T1, R1, and R2 to be particular constituents of two successive utterances, (2) in the figure above, then, can represent a speaker's citation of two supports (R1, R2) for a claim, T1. Under a similar extension, (3) can be used as a representation for, let's say, three

counterchallenges to a claim T1, each counterchallenge having its own respective cited support.

While this is not too bad, it is not yet sufficient. In particular, we are immediately confronted with Woods' dilemma of "What's in a Link?" [143]. That is, while the representations do depict the notion of subordination found in discourse, how do we know, for example, whether R1 is a support or challenge of T1? Alternatively, (2), for example, can either be denoting two supports of T1, two challenges of T1, and/or, perhaps, one support (R1) and one challenge (R2). Clearly, something more elaborate is required.

Let's therefore now turn to some other, more recent works in text analysis, some of which attempt to explicitly differentiate between the notion of subordination and the subordinating relation involved.

10.6 Some structural approaches

There are four major works in the recent past which specifically address a discourse's underlying abstract structure: Linde's work on "apartment descriptions" [84], Grosz's work on "task-oriented dialogues" [49], Weiner's work on "explanation" [138], and Linde&Gougen's work on "planning discourse" [86]. The conclusions of all four are highly similar: all propose an underlying tree structure to discourse, where, at any given point, the "discourse focus" is on one sub-node of the tree. Creation of a subnode, represents further development of a given theme/topic of discourse, traversing up the network corresponds to a "discourse pop," wherein one resumes discussion of an earlier subject which has led to a current subordinated discussion. Below, I present brief overviews of these works, ending the discussion by showing how though Weiner's work does begin to ferret out the distinction between a "tree structure" and the particular relations between nodes of the tree, his representation of a discourse does not yet ferret out enough of the distinctions involved.

(1) Linde's work deals with people describing apartment layouts. Her

main claim is that individuals structure such descriptions in terms of a schematic, temporal "tour-walk" through the apartment. They do not randomly choose rooms to describe, parts of rooms to describe, or the like. Linde posits that describing an object, like an apartment, constitutes developing a single discourse unit, which is composed of lots of subnodes in a tree-like representation. In the apartment situation, each node of the tree corresponds to a room in the apartment and the single relation between all nodes is "physical sequence."

A major conceptual overlap between Linde's work and the context space approach, is that both identify the major inter-relationship between a discourse structure and an individual's choice of referring expression. In particular, Linde notes that items from one node of the tree, referenced at another node, are referred to by the far deictic "that," rather than the close deictic "this."

(2) Like Linde's work, Grosz's analysis depends on a specific domain of knowledge and some goal directed, requested task of a conversant. In Grosz's work, subjects are asked to speak out loud and interact with an "expert" to build a pump. Grosz's dialogues and analysis supported the notion that an individual's utterances can be hierarchically partitioned into some tree-like network. And, like in Linde's work, the discourse structure identified closely corresponds to the structure of the object under discussion. In Grosz's tree representation, the single identified relation between nodes of the discourse tree is the task-subtask relation.

Grosz, then, went even further with the correspondence between the discourse structure, and a conversant's pronominal reference forms. In particular, Grosz found that upon return from a subordinate node in a tree (where no branch cross-over occurred), an individual would immediately re-pronominalize references to constituents at the superordinate node, despite seeming intervening semantic contenders for the pronominal reference in intervening subordinate discussion.

Thus, there are both major correspondences and distinctions between the context space approach and the works of Linde and Grosz. Both Linde and Grosz

emphasize a hierarchical organization of discourse utterances and the influence of such an organization on a speaker's pronominal/deictic reference forms. However, both their works only identify a single relation between nodes based on an external state of affairs being described. In contrast, the context space theory has attempted to characterize a whole set of possible node relations for any given subject of discussion or task of accomplishment (e.g., analogy, interruption, and support).

Another major distinction between the works is that the relations identified by Grosz and Linde both constitute superordinate-subordinate developments. Thus, in Grosz's upward tree-walk along a single branch (corresponding to resumption of a controlling or controlling^{*} context space) pronominalization is always allowed. However, once we introduce the many different types of inter-relationships possible between discourse constituents, with their varying state suspension effects, such a simple tree-like representation of nodes with re-pronominalization rules like the above, proves inadequate. In particular, for example, resuming a "generating" argument space does not allow for immediate repronominalization of the elements contained in this superordinate node.

Lastly, lacking from both Linde's and Grosz's work is recognition or an analysis of the predominate discourse-structure role played by nonpronominalization.

(3) Linde & Gougen's work on "planning discourses" centers on identifying the underlying structure of a speaker's explanation of some plan of action. Once again a strictly controlling-subordinate tree-like representation is presented. In this case, however, non-terminal nodes of the tree explicitly cite one of a number of possible node relations. In the main, their representation of planning discourses is isomorphic to Weiner's structure for explanations,⁸⁹ and I therefore leave exemplification of this approach to my fuller discussion of Weiner's work below.

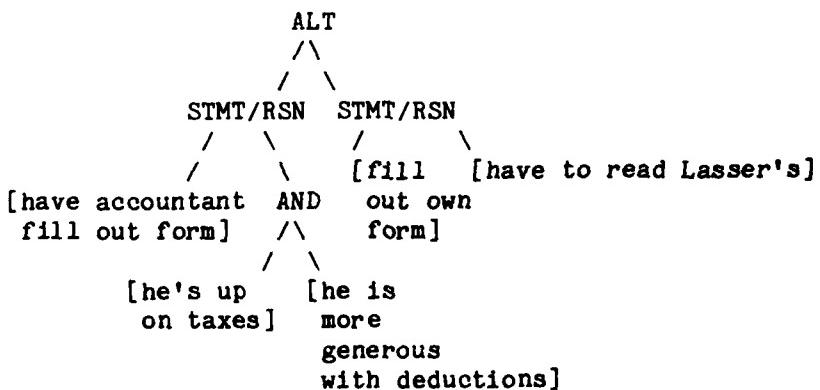
⁸⁹The major difference being the names of the relations at non-terminal nodes.

(4) Weiner posits a tree-like representation for a discourse. Nonterminals of a tree correspond to particular "legal" semantic/logical relationships between successive utterances, terminal nodes of the tree correspond to the specific utterances expressed. The following thematic relationships are identified in Weiner's work:

1. The Statement-AND-Statement relation;
2. The Statement-EXAMPLE relation;
3. The Statement-REASON relation;
4. The GENERAL-SPECIFIC relation;
5. The Statement-ALT-Statement relation;
6. The IF-THEN relation;

Weiner notes that these relations often are built on top of each other, and that a discourse structure, therefore, is usually some elaborate tree. For example, consider Weiner's parse of 2 below:

1. Why a person who is a financial analyst should need to go to an accountant.
2. Because uh particularly this year, he's up on taxes and otherwise I would have to go read the book, you know, Lasser's and go through that.

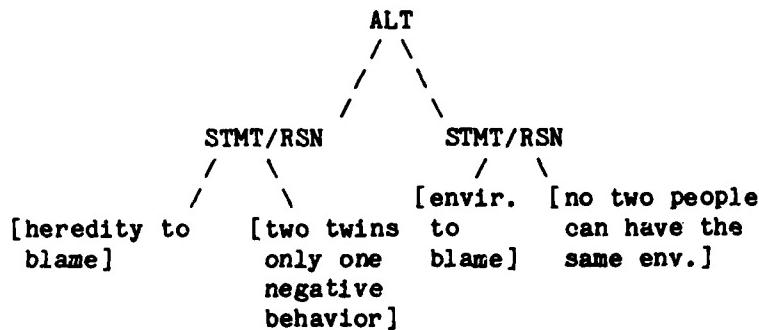


Re my earlier discussion of some underlying common structure to all forms of discourse, we could perhaps posit that Weiner's tree-like representation is this common structure, and that it is only the specific "functional" non-

terminal node relations that distinguish one discourse genre from the next. So, for example, presumably, the narrative genre would have more CAUSE/ACTION relations than ALT relations.

While such a simple solution would be nice, the case of discourse production/interpretation is much more complex than Weiner's structural representation suggests. That is, while Weiner's structural description of a text is clearly more effective and telling than the earlier hypothesized extension of Hymes's "thematic progression" work, it is still too simplistic as an account of the complex inter-relationships found in discourse/text.

For example, let's consider the simple occurrence of a challenge-counterchallenge move in discourse. In the genetic-environmental debate, Excerpt 1, for instance, two alternative positions are at issue: (1) heredity is responsible for an individual's criminal behavior; (2) society, the environment, is responsible for criminal behavior. R, on the side of the "heredity-cause," shows that only one of two twins living at home (presumably sharing the same environment) manifested negative interactive social behavior; D, on the side of the "environment-cause," claims that no two people can ever be said to be sharing the same environment. Using Weiner's structural representation of discourse, the analysis for this argument would be something like:



But the above is clearly an inadequate and misleading representation of the force of the argument that "no two people can have the same environment." Specifically, this claim, per se, is not a support or evidence for the claim

that the "environment is to blame for criminal behavior." Its status as a support for this position, is a derivative one, stemming only from the fact that it is a "Countersupport" to the support given for the "heredity is to blame" position. How can this dual, inherited attribute of "no two people have the same environment," be represented in the above configuration?

In addition, among other things, Weiner's representation system leaves no room for the inferential components needed to explicate how one proposition can serve as support of another (i.e., the implicit support-principle underlying most statements of support), nor does it leave room for the general rule of inference being relied on in the giving of such support (i.e., to distinguish between supports relying on valid inference rules like Modus-Ponens and Modus-Tollens, versus ones relying on invalid rules like $A \rightarrow B$, B , $\Rightarrow A$).

It seems, therefore, that a much more elaborate network of concepts and differentiating connections between nodes are needed to encode the varied interrelationships that exist between a discourse's basic constituents. Non-terminal nodes of the network can not be simple predicates like those proposed by Weiner. A much more sophisticated network construction is needed. I believe the foundations of such a network is provided in the Abstract-Context-Space schemata, and in the discourse ATN proposed in this thesis.

10.7 Some other theories

In this last remaining section of review, I limit discussion to a few specific works which directly relate to, and touch upon, major features of the context space theory.

(A) Bruce on Demand Models: As discussed more fully in Chapter 11, there are some clear distinctions between this Discourse-ATN and more traditional Sentence-ATN's. A major element of differentiation is that this Discourse-ATN does not "push" for each successive conversational move subconstituent development. Rather, as described in Chapters 6 and 7, the grammar begins

each new cycle through its loop from its start state, Produce-Next-Move, wherein, it has available to it an Expectation-List register, many of whose entries correspond to subconstituent development options.

This design choice, I believe, prevents this grammar from falling into the quandary encountered by Bruce in his earlier design of a "Travel Budget Management" ATN system [15]. Bruce found the traditional ATN push approach inadequate and non-insightful on two accounts: (1) a use of traditional pushes would result in a system where not all pushes were accompanied by a following pop; and (2) preceding conversational development often places certain "priority ordered demands" on a co-conversant. Usual ATN configurations leave no room for such dynamic changing aspects governing subconstituent development.

To accommodate these features of discourse, Bruce suggested that "correct" discourse modeling requires a "Demand Model" in place of (or in addition to) a traditional ATN grammar. The Discourse-ATN presented in this thesis, I believe, characterizes one possible integration of the two approaches.

(B) Webber on Evoked Entities: In Chapter 5, I claimed, with some qualifications, that the context space approach could delineate Olson's set of contenders for a pronominal or close deictic reference. In the current design of the grammar, no particular propositional representation of discourse utterances has been chosen. As a result, for example, as of yet, there has been no effort to account for the associated information brought in via mention of a particular concept (*à la* Vendler's notion of "associated entities" [136], e.g., "the car" makes the engine of this car available for definite reference). More importantly, there has also been no accommodation for some of Webber's "evoked entities" [137].

In a thorough study of pronominal reference forms such as "one anaphora," "hypothetical-world anaphora," and/or "set anaphora," Webber illustrates some of the semantic and syntactic complexity involved in certain anaphoric references. For example, Webber shows that given a quantified utterance like, "Mary bought each of the three girls a T-shirt," the set of T-shirts bought,

though not previously referenced as a group, seems to be available, as a group, for a pronominal reference like "them," e.g., "The girls thanked Mary for them." In a later design of the grammar, Webber's notion of evoked entities and her mechanism for their delineation will have to be included as a component of the grammar.

(C) Hobbs on Coherence: Hobbs [62] posits that the underlying coherence of a text can be explained via characterization of binary relations between successive utterances. His list and formal characterization of binary coherence relations includes, among others:

- o Elaboration; Evaluation; Exemplification; Enablement; Generalization; Strong Temporal.

Hobbs' objects of study are sentence sequences like:

1. John brushed his teeth and combed his hair.
2. He was in a foul humor. He hadn't slept well that night. His electric blanket hadn't worked.
3. John opened the safe. He knew the combination.

In the main, Hobbs's analysis focuses on explication of "world knowledge" connections between events in the external world. He presents an underlying tree-like structure of discourse, similar in form to Weiner's described above. He does not attempt to characterize the complex network of context space structures underlying discourse development. He does not attempt to characterize sets of standardized inference components needed for identification of particular types of conversational moves, nor does his work focus on the functional nature of discourse.

More importantly, Hobbs' analysis does not correctly capture the many dynamic features of discourse engagement, where, in the main, successive utterances do not relate to linearly preceding ones. Rather, as illustrated in this work, subsequent conversational development frequently entails resumption of a preceding context space in a manner suited to the form of preceding suspension.

More recently, Hobbs has introduced functionality in his analysis [64], but he does not do so at the level of "communicative goal" identification. Rather, his new work focuses on identification of such underlying speaker psychological goals like "impress my listener," "don't sound snobbish or conceited," "talk about something interesting," etc.

(D) Collins on Inferencing: In an extensive work, developed over a number of years, Collins [30] has identified a number of major general inference patterns and their respective levels of certainty conditions that seem to govern an individual's reasoning procedures (as exemplified in oral justification/explanation tasks). The following are but some of the inference types Collins discusses:

- o Functional Abduction on Importance Level; Meta-Induction From Cases; Lack of Knowledge Inference; Simple Comparison; Functional Attribution on Importance Level; Spatial Superpart Inference.

At a later stage of development, I look forward to include such inference patterns, with their levels of associated certainty, as criteria governing a speaker's choice of a given conversational move and a particular mode for fulfilling the move.

(E) Polanyi on Story Development: In a very comprehensive study of oral narratives, Polanyi [105] focuses on a number of issues closely related to the context space approach to discourse. In the following I will briefly describe two major conceptual overlaps of perspective between her work and the context space approach.

In her study of oral narratives, Polanyi notices that speakers often begin a story with an abstract of some sort, which they immediately follow with a first event of the story event-line. However, Polanyi notes, the retelling of this first event, is more likely than not interrupted in mid-stream. Usually, the interruption is followed by the speaker's citation of some "interesting" background material whose relevance only becomes apparent at a later point in the story's re-telling. After completion of the background material, speakers resume from the point of interruption.

Polanyi claims that such "false starts" are not errors or accidental interruptions. Rather, in a sense, they can be thought of as planned behavior necessitated by rules of "turn-taking." In order to "get hold of the floor," a speaker starts her/his narrative with an explicit statement of its relevance to a current topic of discourse. S/he, then, begins the narrative, which using Sack's analysis described earlier, gives her/him the right of floor until completion of the story. Once having the floor, the speaker begins to relax and slightly indulge in the telling of the story (e.g., elaborating on some points of background, etc.).

Most interesting about Polanyi's work is her observation that such false starts and resumptions can be thought of as "pushes" and "pops." Thus, unlike a lot of other discourse work described earlier, Polanyi immediately focuses on the non-linear dynamic features involved in discourse engagement. In addition, Polanyi notes, false-start resumptions are regularly linguistically marked with the clue word "So," and repetition of the phrase interrupted [106].

Both the push-pop and linguistic signals observed by Polanyi complement the type of discourse analysis given here. The false-start interruption is not like a "topic shift" interruption and hence does not warrant the clue word "Anyway." It functions more like a cross between a side-comment interruption and the building of a subconstituent suspension. That is, in some sense, the initial story abstract and partial event cited are constituents controlling development of the "setting" subconstituent of the narrative. As illustrated in Chapter 4, the clue word "So" accompanies resumption of a superordinate after subconstituent building (e.g., "So" used after a support relation). In a preceding work, where I discuss side-comments [112], I note that an appropriate return mechanism for side-comments is a linguistic repetition of the utterance interrupted. That both repetition and the clue word "So," are used in false starts, shows that the intervening material is not mere

tangential, interesting side-comment material⁹⁰.

(F) Sidner on Focus: Sidner's main concern is to demonstrate that discourse pronominalization is a major feature enabling effective communication in extended discourse. Her claim is basically that "focus of attention" is the major criteria governing discourse pronominalization, and that a speaker's use of a pronominal will correspond to the discourse element that the speaker has in focus [127].

At this conceptual level of discussion, Sidner's work seems highly compatible with the context space approach. The major problems, however, are that while conceptually discussing a discourse oriented view towards pronominalization, the actual focus-pronominalization mechanism designed by Sidner is both linear and syntactic/semantic in form. In the following, I highlight a number of major noncorrespondences between the two approaches.

(1) Most of Sidner's rules for focus identification are based on syntactic features of a single utterance (e.g., the subject of a there insertion clause, the object of an action, etc.). In her work, there are no rules like, "A constituent of a supportive context space, which is in high focus in the controlling issue context space, is assigned an initial high focus level assignment in the subordinate support space."

(2) In Sidner's system, a speaker can arbitrarily shift his/her focus from a constituent A onto a constituent B, accompanied by an immediate pronominal reference to B despite the immediately preceding pronominal reference to A. In analyzing actual dialogues, however, we see that conversants do not usually do this. Rather, per the context space theory's rules of focus pronominalization (cf., [112], [113], Chapter 5 this thesis) a constituent must already be in high focus by the time it is pronominalized. Hence, speakers first establish constituent B as being in high focus and un-establish constituent A as the focus element, before they pronominalize a

⁹⁰This example illustrates, I believe, the often complex and dynamic inter-connectivity found between rules of maxim-abiding discourse development.

subsequent reference to B (cf., for example, Excerpts 11, 13, 14, and 15 in Chapter 5). Thus, for example, in an analysis of spontaneously generated dialogues, at those places where speakers do such focus shifting, we frequently find an intervening utterance wherein neither A nor B is pronominalized.

(3) Sidner's focus mechanism also nondiscriminately allows for the repronormalization of old discourse foci, as long as interveningly there are no syntactic and semantic contenders for the pronominal. In addition, the mechanism retrieves this old foci by linearly searching through a stack of all preceding foci. Both these features are in direct conflict with the context space approach:

1. The context space theory clearly differentiates between environments that allow for an old foci to be immediately repronormalized, and those that do not. In particular, only old foci in a controlling*, controlling, or open context space are available for immediate repronormalization (e.g., context spaces suspended for interruption, analogy development, subordinate support developments, and the like).
2. A major point of the context space theory, is that any maxim-abiding pronominal reference form is usually immediately resolvable. That is the whole point of "focus-pronominalization." Thus, reference resolution should rarely involve a linear search through some first-in last-out type of stack.
3. The context space theory has stressed that intervening syntactic and semantic potential contenders, usually, do not govern a speaker's pronominal use. For example, if the intervening context spaces in which these seeming semantic and syntactic contenders lie have closed state assignments, then, these elements should not be considered contenders at all. Their syntactic and semantic appropriateness for the pronominal does not in anyway constrain a speaker's subsequent use of a pronominal form to another discourse constituent.

(4) As illustrated in this work, and in earlier papers, discourse nonpronominalization (rather than pronominalization) is a major feature of "maxim-abiding" discourse development. Constraints on focus pronominalization are largely dependent on the abstract context space schemata underlying a

discourse (not on semantic and syntactic criteria as implied by Sidner's mechanism). So, for example, if a subsequent utterance simultaneously closes a preceding context space and begins a new one (or returns to a preceding closed one, for example), then, using the rules of focus-pronominalization, pronominalization to an entity of such a closed space is "illegal." Thus, in natural discourse, we often find two successive utterances, wherein in the second utterance object A is not pronominalized, though, it was last pronominalized in the preceding utterance (and, in addition, the next pronominal reference is once again to object A). Sidner's focus machine gives no account of such nonpronominal occurrences.

10.8 Conclusions

The purpose of this review chapter has been to compare and contrast a sufficient number of approaches to discourse analysis so as to give the reader some sense of where and how the context space approach relates to other works in the field, and wherein lies its major contributions.

In concluding this review chapter, I would like to remind the reader that discussion and references to some works not included in this chapter can be found in preceding sections of the thesis. In addition, let me state the obvious: text analysis is currently in high vogue and there are hundreds of other works addressing aspects of text/discourse analysis. While many of these works are very interesting, and pertinent in different ways to the context space analysis, it is simply beyond the scope of this chapter to cover, mention, and address all such works.

11. CONCLUSION

In the body of this thesis I have demonstrated that informal, spontaneous discourse lends itself to a formal analysis, and that it can effectively be modeled by a discourse ATN, whose register testing and actions on arcs capture many of the context-sensitive features of discourse engagement.

A main point of the work has been to illustrate that "relevant context identification" is a (the) primary element enabling "coherent," effective oral communication. Relevant context identification is enabled by listeners knowing a set of standardized conversational moves, and the set of preconditions and effects associated with each of these moves.

As amply illustrated in the thesis, usually, the relevant discourse context for subsequent discussion, does not consist of the linearly, temporally preceding utterances last generated. Discourse popping (i.e., varied forms of subject suspension and resumption) is a major feature of spontaneous discourse.

The context space theory has been able to delineate an abstract hierarchical "deep-structure" underlying all discourse forms. And, it has been able to formalize a set of "maxim-abiding," discourse "well-formedness" rules, which I believe are applicable to all discourse genres.

The following is a recapitulation of the four major themes addressed in this work:

1. A structural analysis of discourse;
2. A theoretical framework for the analysis;
3. An abstract process model capable of generating/interpreting "well-formed" discourse;
4. Relation of formulated theory to other cognitive processing tasks.

In the body of this thesis, each theme has been discussed, and an attempt has been made to integrate them into a single coherent theory of discourse processing.

The formal analysis presented has enabled a more precise specification of Grice's maxims and has allowed us to answer many of the questions raised by his work. For example, answering each of the initial five questions raised in the introduction, we now know that:

(1) A "relevant discourse context" is a current active and controlling context space pair. (2) Discourse pronominal references are limited to elements in "high focus" in this relevant discourse context. (3) Each move formalized in the context space theory has an associated set of preconditions specifying its "appropriateness" at any given state of discourse - these preconditions are based on preceding conversational development as reflected in the status of the discourse model. Each move also has an associated set of effects which entail setting up expectations for subsequent conversational development, changing the influential status of preceding context spaces, their associated focus level assignments, and setting registers that constrain certain options of further development. (4) Traditional theories of ambiguity do not greatly determine what would be an ambiguous reference, rather, the discourse structure determines appropriate reference criteria. For example, a pronominal reference is not necessarily ambiguous even though in terms of linear order a possible contender for this reference seems available. (5) In the context space formalism, many rules of "relevance" have been defined in terms of a set of primitive logical and semantic content-relational rules of coherence between utterances being generated and those contained in the current active and controlling context space pair.

The last question raised in Chapter 1, vis-à-vis Grice's maxims, was whether given a finer specification of the maxims, one could design an abstract process model of maxim-abiding, well-formed discourse. This question too has been answered in this thesis, and the Discourse-ATN grammar, formalized in the work, should be seen as its answer.

The Discourse-ATN grammar, designed to encode/formalize the context space theory, models discourse in consistent fashion with many currently held beliefs in cognitive science. Its processing is focused, proceeds via frame

of reference identification, and is guided by cues, expectations, and segmentation.

The grammar has also been able to shed light on some issues current in today's study of some specific cognitive processing tasks. For example, I have shown that the "functionally-oriented" context space theory can explain and predict when and why conversants may reject an analogy in spontaneous discourse. The theory incorporates Lakoff & Johnson's notion of an analogy "highlighting" and "hiding" aspects of two domains under comparison. And, its "communicative goal" analysis enables a characterization of which relations of two domains being compared must remain identical (i.e., elaboration on Gentner's "structure-mapping" approach).

In addition, the work's analysis of spontaneously generated debates has illustrated that many informal debate moves can be formalized in terms of abstract, high level, logic-like rules of inference. I have shown that using the "focus-orientation" of the context space theory, we can explain certain noncorrespondences between a formal logic system and human performance. In particular, I have argued that an individual's use of formal rules of inference are "goal" directed, as determined by the structural nature of a preceding discourse, and entities considered in focus in this discourse structure.

The context space theory is based on a decomposition of a discourse into a set of hierarchically organized, distinct, but related and linked, context space constituents. Context spaces are characterized by slots similar to case frames. The slots capture information both explicit and implicit in the dialogue. Nine types of context spaces have been identified and characterized in a systemic grammar fashion. Characterization of the different types of context spaces is functional in nature, and dependent on the standardized inferential elaborations needed for a space to fulfill a given type of "communicative goal."

Communicative goals have been distinguished in this work from speaker intent, and can probably be thought of as their conventionalized analogues. That is, the standard set of conversational moves identified in the grammar

can be said to be developed standardized means for speakers to express underlying intents, goals, and plans.

The remainder of this chapter shall focus on some open issues raised by the work and some possible future lines of development corresponding to these open issues.

11.1 The Discourse-ATN

11.1.1 Credence of design

The grammar's basic design enables minimal preprocessing to be performed before different paths of the grammar, corresponding to very different discourse environments, can be merged into joint procedures. In essence, the grammar's design is quite simple, and is based on keeping track of a small set of discourse structures that are used for varying purposes in varying conversational environments.

Construction of the grammar began after much of the context space discourse theory was already developed. Most of its early design choices, corresponding to the theory already worked out, were never changed and proved sufficient to the task. However, in pushing the grammar forward, a number of new, unforeseen issues arose. In the beginning, each new subproblem would lead to the addition of a discourse register, slot in a context space, a new discourse state, or the like. However, after a short while, the system proved to be self-sufficient, and with minor re-adjustments, constructs and solutions developed for earlier issues were found reusable for the solution of a new sub or larger problem.

For example, the early design decisions of (1) having an expectation register, (2) having distinct expectations for challenges and further challenges (based on the fact that only further challenges necessitated discourse popping), and (3) having a distinct routine for further supports

(based on similar reasoning) later enabled easy design of the grammar's routine corresponding to the Concede-Subargument conversational move in debates. In particular, as discussed in Chapter 7, the grammar was able to accommodate the discourse popping often necessitated in a Concede-Subargument debate move by using the same mechanisms that it had early designed for further-challenges. And, as described in Chapter 7, after some slight initial testings and readjustments, the paths for these distinct conversational moves can be (and are) merged in the discourse grammar.

Comparable to a theory being given more credence based upon the succeeding number of phenomena that it can explain, so here too, the design choices that were independently characterized and which then turned out to make another facet of the grammar clearer and more efficient, seems to lend credence to a number of the design choices taken in its construction.

11.1.2 Generation rules and the relevant discourse context

As illustrated in the thesis, the grammar, usually, processes subsequent utterances in the context of a relevant discourse context, composed of a controlling and active context space pair. This is accommodated by having (in general) its substantive generation rules only access the HEAD-CCS and CCS registers.

In order to accommodate some types of analogy-challenges, however, I was forced to make an exception to such a rule. And, in making the exception I was forced to make a second exception as well. That is, in some cases of analogy rejection, the generation rules do not access the HEAD-CCS register, but rather, they access a special register (called the Analogous-Space register) which was designed for this one specific conversational move. In general, however, the grammar's registers are used in varying discourse contexts and for a variety of purposes. Below, I briefly outline the linguistic causes of these two exceptions. I leave as an open question whether there are some minor re-adjustments to the rules, or further

distinctions to be made in the theory, which would forestall the necessity for such special treatment of some forms of analogy rejection.

(1) Initiating and analogous utterances of an analogy must be segmented into distinct context spaces. During development of an analogy, the initiating space must have a controlling, or controlling* status, and upon return to the initiating space, the analogous space should be assigned a closed state. Under such treatment, we can use the context space's general rules of reference to explain why upon return from an analogy, conversants use close deictics to refer to the linearly far elements of the initiating space, despite seeming semantic and syntactic contenders for these references in the linearly closer analogous space (cf., for example, Excerpt 7, Chapter 5).

(2) In an analogy-challenge wherein aspects of the two domains being compared are contrasted, conversants use close deictics to refer to constituents of the linearly far initiating context space, while they use far deictics to refer to elements of the linearly closer analogous space (cf., for example, Excerpt 8, Chapter 5). For the grammar to continue to use its general rules of reference for such cases, during the analogy-challenge, the grammar must keep the initiating space in its controlling status, and reassign the active analogous space, a generating state assignment. Conceptually, this is quite acceptable, since, unless accepted, the global topic of discourse is still governed by the initiating space of the analogy.

(3) In generating the substantive remarks of such an analogy-challenge, however, the grammar must be able to access constituents of both the initiating and analogous spaces. Accessing the "Abstract" and "Mappings" slot of the generating analogous space gives the grammar access to constituents of both spaces. Hence, substantive generation rules here must access the generating analogous context space, rather than the current controlling context space which only contains constituents of the initiating space of the analogy.

11.1.3 Pushes and Pops

As discussed in the body of the thesis, the grammar begins a new cycle through its basic loop for each successive conversational move taken. Thus, for example, though a support move is a possible subconstituent for a preceding claim move, the grammar does not push from the claim move to the support move. Rather, it re-enters its cycle afresh, and in a sense, independently, now chooses the support move.

This design choice cleanly handles the following common features of discourse development: (1) a given constituent has many possible subconstituents; (2) developing one subconstituent can make development of another subconstituent "inappropriate;" (3) subconstituents are often not immediately developed; and (4) interruptions can occur at any discourse stage.

The grammar's specific accommodations for the above includes treating each subconstituent path independently accessible with its own set of preconditions and associated effects. Likely development of any number of subconstituents is accommodated by generation of outstanding expectations for their development; when subsequent development "outdates" a preceding subconstituent option, the corresponding discourse expectation is deleted from the Expectation-List register.

The advantages of the traditional "pushes" in Sentence-ATN's is that on a push one can pass register values to subordinate routines to facilitate a proper context for subconstituent development, and that upon return form a push, the initial configuration (before the push) is immediately available. These features are accommodated in this Discourse-ATN by different means. For each expectation created, the grammar notes, within the expectation, the preceding context space that should serve as the surrounding context in development of the subconstituent. Then, when and if, such an expectation is chosen, the grammar can immediately reset the discourse model to have the appropriate context re-established. Such discourse popping is necessitated in any case, when, for example, conversants return to closed context spaces.

As a result of the many excerpts analyzed during development and

refinement of the context space theory since 1977, I would posit that there are two main classes of moves which seem to warrant a more traditional ATN push for subconstituent development. The first class is where a speaker's utterances serve as support for an implicit challenge-claim. The speaker's move begins with "clue words" appropriate to the type of implicit challenge-claim implied. Modeling this move, the process model goes to the challenge-state of the grammar, it constructs an implicit challenge context space, and then it pushes, on the same cycle, to the support-state. The second class also involves a challenge claim-support move. Here, too, a speaker begins citation of the challenge with "clue words" appropriate for the type of challenge being generated, but then, before completing the challenge, the speaker gives an authority-support for the claim to be generated. The following excerpt, taken from Excerpt 1, exemplifies this type of conversational development.

R: 1. Except however, John and I just saw this two hour TV
2. show,

M: 3. Uh, hum.

R: 4. where they showed - it was an excellent French TV
5. documentary - and they showed that, in fact,
6. the aggressive nature of the child is not really that
7. much influenced by his environment.

R's clue words, "Except, however," and Lines 6 - 7 of the excerpt form part of her Challenge-Claim move; her embedded utterances on Lines 1 - 5, are part of an Authority-Support move for this claim.

Modeling this complex interaction of the two conversational moves, in essence, yields an exception to the case that one cycle through the network yields one conversational move. Here we have two moves on one cycle. They must be modelled within a single cycle, else beginning the second conversational move in the midst of the first would have to be treated like an interruption. However, there is no interruption going on here.

Despite the exceptions needed for the above two classes (both of which have to do with claim & support interactions) I am inclined to feel that the current design is correct. It is conceptually simple, it seems to handle most cases, it allows for much flexibility, and it does not lead to any intricate pushing-popping confusions/complexities that I fear would arise using a more traditional approach.

In addition, traditional notions of pushes and pops stem from the notion of a "push down stack" automaton. The dynamics of discourse engagement, however, are not formally like a push down stack. Subconstituents are optional, they can occur at a number of different stages of the discourse, and one subconstituent option does not have precedence over another. Corresponding to its stack-like discourse operation, however, in ordinary ATN's, each successive push warrants an accompanying pop. In discourse, though, depending on the type of suspension involved, an accompanying pop is not necessarily warranted or obligatory. For example, in the case of Further-Challenges, one may immediately "pop" as high up in the argument structure as desired. Explicit closing and mention of intervening "generating" subarguments is not necessitated. Traditional ATN pushes and pops for all subargument developments, then, would "illegally" require pushes with no accompanying pops⁹¹.

In spite of the above, it is perhaps warranted, in any case, to try out using a more traditional ATN approach in a subsequent re-write of the grammar. Then, we would have the data needed to ascertain the actual trade-offs involved between the two distinct approaches.

11.1.4 Why call the grammar an ATN

⁹¹This is similar to Bruce's experience when he tried to construct his "travel budget ATN grammar" [15], as discussed in Chapter 10.

The above discussion has highlighted one major difference between this discourse grammar and one's usual notion of an ATN. There is, however, another difference worth mentioning. Actual discourse generation (except for clue words which are generated early on in any given cycle) usually occurs in one lump at the end of a whole set of transitions. In traditional ATN's, of course, generation of the constituents of an utterance occurs piecemeal.

Despite the differences, I continue to refer to the grammar as an ATN. Why? Basically, because of two reasons:

(1) Discourse constituents are not simply the utterances generated; they are the context spaces containing these utterances. Each of these spaces is constructed and further characterized by successive pushes on a single cycle through the grammar's transitions in its further subcategorization of the type of conversational move being processed. Thus, most pushes do correspond to a further building of discourse constituents, though not all subconstituents are built on successive pushes.

(2) As described earlier, there are major conceptual correspondences between traditional Sentence-ATN's and the Discourse-ATN constructed here. In particular, the correspondences of ATN tests and actions on transitions to capture context sensitive features of successive constituents. As illustrated in the thesis, arc transition tests and actions are primary elements enabling the grammar to model maxim-abiding discourse generation/interpretation.

11.1.5 Next phase of grammar design

As stressed throughout this thesis, the grammar only encodes one set of rules operative at the discourse level. As the grammar has been designed with the intention of a future computer implementation, a major concern in my next phase of research will be to investigate the issue of hooking-up the context space discourse module with other available natural language processing modules - e.g., a syntactic parser/generator, a semantic analyzer, and a pragmatics module(s). It is my intention to try to design a system wherein

all these different components have a bi-directional feed back system. Such a design has already been incorporated between the syntactic and semantic components of the "Rus" parser system [11, 12]. Using Woods' notion of a "Cascaded ATN" [144], I believe, we can have full interaction between all the different components needed to model extended discourse.

Assuming for example that we are in interpretive mode and the syntactic component comes across a "clue word(s)," I would expect this information to be immediately sent on to the discourse component. Having this information enables the discourse component, in turn, to posit the set of likely conversational moves corresponding to this clue word in the given discourse context. Identification of these most likely conversational moves, then, enables the discourse analyzer to posit an appropriate relevant discourse context for subsequent interpretation, and likely interpretations for constituents of the subsequent utterances.

For example, if the clue words recognized are "But anyway," and the discourse analyzer has an "open" context space in its discourse model, it could then with reasonable certainty tell the syntactic and semantic components to use this open context space as the context in relation to which subsequent interpretation should proceed. In addition, the syntactic and semantic components would then know that a subsequent pronominal reference probably refers to the discourse constituent in "high focus" in this open context space (which the speaker seems to be returning to).

11.2 Structure characterization yet to be done

In Chapter 8, I carefully characterized a level of structure embodied in the context space theory, which I felt underlay all forms of discourse engagement, and I claimed that a number of misleading statements have been generated by other approaches to text/discourse analysis, specifically, because these works did not carefully characterize the level of structure they were studying. Lest, however, I leave the reader with the impression that all

questions of structure characterization have been adequately addressed in this work, I must point out that, in a sense, I have only carefully distinguished between the end points of the "structure-spectrum" addressed in the context space theory. The mid-points of this spectrum remain hazy.

For example, at one end of the spectrum, I posit that the work's notion of a discourse structure is the Abstract Context Space Schemata characterized in Chapter 8 (i.e., a hierarchical, tree-like organization of abstract context spaces, only some of which may play a foreground role at any given point in time); at the other end of the spectrum, let's posit the particular semantic and logical relations identified in the grammar's generation rules (i.e., one level above content schemata). Where, however, does the notion that a context space can be interrupted lie? The notion seems quite general, but not, however, as general as the notion of a tree. Similarly, the fact that context spaces can have subconstituents seems fairly general, equivalent to the notion of a daughter node. But what about the particular fact that a "supportive narrative context space" is a subconstituent of an "issue context space?" Is this fact, perhaps, at the level of "textual schemata?" Does it matter?

There are no immediate answers to such questions, and none shall be offered at this time. I merely raise questions like the above as issues that need to be dealt with both in this work, and in all text analysis systems attempting to characterize a discourse structure, and whose claims are based on such a characterization.

APPENDIX I
THE CONTEXT SPACE ATN GRAMMAR

(1) Basic Organizational Routines

Produce-Next-Move:

```
Choose ( A: If Not(Expectation-List = Nil)
         Then Expectation
               <-- Choosed(Expectation-List)
         Go Expectation.Function

        B: If Discourse-Mode NE "Debate"
            Then Go Developmental-Choice/Step 1

        C: If Discourse-Mode = "Debate"
            Then Go Developmental-Choice/Step 2

        D: Go NonDevelopmental-Choice

        E: Go Transitional-Utterance)
```

Developmental-Choice/Step 1:

```
Choose (A: Go Start-Debate/Step 1

        B: Go Step 2)
```

Step 2:

```
If CCS.Comment NE Nil
  Then Choose(1. CCS.Comment.Claim APPEND CCS.OldComments
              2. Push Convert-Comment-Issue)
```

Step 3:

```
Choose( A: Go Further-Development-Choice
```

B: Go Pre-Generalization-Choice
C: Go Generalization-Choice
D: Go Negative/Positive-Evaluative-Choice
E: Go Explain-Choice
F: Go Question-Choice
G: Go Comment-Choice
H: If CCS.Modality NE Nil
Then Go Support-Choice
I: If CCS.Goal = "Support"
Then Type-Further-Challenge <- "Support"
Go Further-Challenge-Support/Step 1)

Support-Choice:

Step 1:

Note: A previous speaker may continue in the speaker role by providing evidence for his/her previous made claim. Alternatively, a hearer may take on the speaker role by agreeing with the previous speaker's claim and giving supportive evidence of it.

Note: Choosing whether to shift speakers.

Choose(1: Push Shift-Speakers
Speaker EXPRESS agreement word ("Yeah", "Really")

2: No-Op)

Step 2:

Push Support-Of

Step 3:

Choose(1: If HEAD.CCS.Mode = "Implicit"
& Type-Further-Challenge = Nil
Then (POP)

```

    Else Type-Further-Challenge <- Nil
        Go Produce-Next-Move

2: Type-Further-Challenge <-- "Support"
    Push Further-Challenge-Support/Step 1
    Go step 3)

```

Support-Of:

Step 1:

```

If CCS.Modality = "Deontic"
    Then Note: Create Implicit Evaluative space to be supported.
        rmode <-- "Implicit"
        rcontextual-function <-- [
            function <-- "Inference-Of"
            co-relator <-- CCS]
        Push Create-EI
        CCS.State <- "Generating"
        CCS <- #
        CCS.State <- "Active"

```

Step 2:

```

If Type-Further-Challenge = "Support"
    OR
    CCS.SupportCS = Nil
    Then nc <- Push Construct-Support-Space
    Else nc <- CCS.SupportCS

```

Push Update-Support-Analogy-Challenge

```

If CCS.Authority = Nil
    OR
    Oneof(CCS.Authority.Source, CCS.Authority.Access,
          CCS.Authority.Credentials, CCS.Authority.Method)
    = Nil
    Then Choose(1: Push Cite-Authority
                Go Step 3
                2: Push Cite-Authority
                3: No-Op)

```

Note: Choosing mode of support & generating clue words appropriate for that mode.

Choose(1: Note: Support By Analogy
 If HEAD-CCS.Mode NE "Implicit"
 Then Speaker EXPRESS ("Because") ("It's Like")
 Push Convert-Analogus-Space
 Go Analogy/Step 2

2: Note: Support By Narrative
 If HEAD-CCS.Mode NE "Implicit"
 Then Speaker EXPRESS ("Like")/("Like When")
 Push Narrative-Support

3: Note: Support By Generic Principle & Support-Fact
 If CCS.Authority NE Nil
 Then Speaker EXPRESS CCS.Authority showed/demonstrated/etc
 that by method of evidence gathering
 CCS.Authority.Method <- method noted
 Else If HEAD-CCS.Mode NE "Implicit"
 Then Speaker EXPRESS ("Because")
 If HEAD-CCS.Modality = "Evaluative"
 Then Push Evaluative-Implication
 Else If HEAD-CCS.Claim.Epistemic-Predicate
 = Not-True"
 Then Push Modus-Tollens
 Else Push Modus-Ponens)

Step 3:

If Not(CCS MEMBER HEAD-CCS.SupportCS)
 Then CCS APPEND HEAD-CCS.SupportCS

(POP)

Start-Debate/Step 1:

Discourse-Mode <-- "Debate"
 Future-Defender <- Speaker
 side{1} <- (Speaker)

Choose (A: Push Shift-Speakers

B: Go Step 2)

Step 2:

```
side{2} <-- (Speaker)
Sides    <-- (Side{1},Side{2})
```

Go Challenge-Choice/Step 2

Challenge-Choice/Step 1:

Future-Defender <- Speaker

Choose(A: Push Shift-Speaker-Expectation

B: knownside <-- Expectation.Speaker
 Push Shift-Speaker-Sameside)

Step 2:

If Not(CCS.Comment.Contextual-Function.Method
= "Flat-Rejection")

AND

(Expectation.Associated-Constraints
NE "Supply-Support-Claim"
OR
"Supply-Support-Rejection")

THEN If (CCS.Goal NE "Support"
Or CCS.Goal = "Support" & CCS.Method EQ "Analogy")
Then (Further-Challenge, Speaker, CCS)

APPEND
Expectation-List

Else (Further-Challenge, Speaker, HEAD-CCS)
APPEND
Expectation-List

If Expectation.Associated-Constraints
= "Supply-Support-Claim"

THEN Expectation.Associated-Constraints <-- Nil
Go Support-Choice/Step 2

ELSE If CCS.Comment NE "Challenge"

THEN

If CCS.Goal NE "Support"
THEN If Not(Speaker MEMBER CCS.Antagonists)
 THEN Speaker APPEND CCS.Antagonists
ELSE If For Some I,
 Not(Speaker
 MEMBER

```

    CCS.Contextual-Function
        .Co-Relator{I}.Antagonists)
S.T. CCS.Contextual-Function.Method{I}
      NE "Inference-Of"/"Derived-From"
THEN Speaker
APPEND
CCS.Contextual-Function
    .Co-Relator{I}.Antagonists

```

Choose (A: Push Challenge-Directly/Step 1
 B: Push Challenge-Indirectly)

Step 3:

```

Expectation <-- [
Function   <-- Challenge-Choice
Speaker    <-- Future-Defender
Context    <-- CCS ]

```

```

Expectation APPEND Expectation-List
Expectation <-- Nil
Type-Further-Challenge <- Nil
Go Produce-Next-Move

```

Challenge-Directly/Step 1:

CHOOSE (

```

A: If Not(Expectation.Associated-Constraints
      = "Supply-Support-Rejection")
    AND
      Not(For Some I, CCS.Contextual-Function.Method{I}
          = "Deny-Truth")
    AND
      Not(CCS.Comment.Contextual-Function.Method
          = "Flat-Rejection")
    AND
      Not(For Some I, CCS.Contextual-Function.Method{I}
          = "Apply-Expansion")

```

Then Choose(1: Go Emotive-Flat-Rejection

```

2: Push Irrelevance-Rejection
  If * EQ Nil THEN (POP))

```

B: If Not(Expectation.Associated-Constraints

```

        = "Supply-Support-Rejection")
AND
CCS.Comment.Contextual-Function.Method
= "Flat-Rejection"

```

Then Go Demand-Support-Rejection

```

C: If Not(Expectation.Associated-Constraints
           = "Supply-Support-Rejection")
    AND
    Not(CCS.Comment.Contextual-Function.Method
         = "Flat-Rejection")
    AND
    (CCS.Goal NE "Support"
     Or
     CCS.Support-Fact = Nil
     Or
     CCS.SupportCS = Nil
     Or
     CCS.SupportCS.Support-Fact = Nil)

```

Then Replace Expectation on Expectation-List with
 Context = CCS or HEAD-CCS,
 Function = "Further-Challenge",
 Speaker = Speaker,

With Function = "Challenge-Choice", leaving all else the same.
 Go Demand-Support-Claim

D: If Type-Further-Challenge EQ Nil

```

        AND

(CCSC.Goal = "Challenge"
 Or
(CCSC.Goal = "Fix-Claim"
 And
 For Some I,
 CCS.Contextual-Function.Co-Relator{I}.Goal
 = "Challenge")
 Or
(CCSC.Goal = "Support"
 And
(HEAD-CCS.Goal = "Challenge"
 Or
(HEAD-CCS.Goal = "Fix-Claim"
 And
 For Some I,

```

```
HEAD-CCS.Contextual-Function.Co-Relator{I}.Goal  
= "Challenge")))
```

THEN Go Concede-Subargument

E: Note: Choosing whether to attack claim or support, if appropriate.

```
If CCS.SupportCS NE Nil  
Then Choose(1: No-Op
```

```
2: space <- CCS  
Push Generating-Space  
CCS <- Last(CCS.SupportCS)  
CCS.State <- "Active")
```

```
Else If CCS.Goal = "Support"  
Then Choose(3: No-Op
```

```
4: space <- CCS  
Push Close-Space  
CCS <- HEAD-CCS  
CCS.State <- "Active"  
HEAD-CCS <- Nil)
```

Note: Generating appropriate clue words for direct substantive challenge.

```
If Type-Further-Challenge EQ Nil  
Then If Expectation.Associated-Constraints  
= "Supply-Support-Rejection"  
Then Speaker Express ("Because")  
Expectation.Associated-Constraints <- Nil  
Else  
If CCS.Method NE Oneof("Modus-Tollens",  
"Modus-Tollendo-Tollens",  
"Modus-Tollendo-Tollens")  
Then Speaker EXPRESS ("No") ("But")  
Else Speaker EXPRESS  
("Well") ("Of course") ("But")
```

Note: Constructing new challenge space.

```
If CCS.Modality = "Evaluative"  
OR  
HEAD-CCS.Modality = "Evaluative"  
Then nc <- Push New-Challenge-EI  
Else nc <- Push New-Challenge-EPI
```

Push Update-Support-Analogy-Challenge

Note: Choosing whether to preface substantive claim with an authority support.

Choose(1: Speaker EXPRESS "It's well known that," or the like

- 2: Push Cite-Authority
CCS.SupportCS <- *
(Speaker EXPRESS *.Authority.Source
{Showed/Demonstrated/Claimed, etc.} that)
- 3: No-Op)

Note: Choosing one of many forms of direct challenges.

CHOOSE (A: If CCS.Goal = "Support"
&
 CCS.Contextual-Function.Method NE "Analogy"
Then
Push Challenge-Support-Specifics

B: Push New-Factor

C: Push Range-Application

D: If For Some I,
HEAD-CCS.Contextual-Function.Method{I}
= "New-Factor"
Then
Push Irrelevant-Factor

E: Push Deny-Truth

F: If For Some I,
HEAD-CCS.Contextual-Function.Method{I}
= "Analogy"
Then
Push Switch-Controlling
Push Challenge-Analogy-Mappings))

Step 2

(For Some I,
(CCS
APPEND

```
(If HEAD-CCS.Goal = "Support"
  &
  HEAD-CCS.Contextual-Function.Method NE "Analogy"
  Then HEAD-CCS.Contextual-Function.Co-Relator{I}
    '.CounterSupports
  Else CCS.Contextual-Function.Co-Relator{I}
    .CounterClaims)

S.T. CCS.Contextual-Function.Method{I}
  NE "Derived-From" OR "Inference-Of")

(POP)
```

Challenge-Indirectly

Step 1:

Note: In this type of challenge, the antagonsit does not directly attack the validity of a protagonist's claims or evidence of those claims. Rather, the antaglonist attacks the protagonist's position by arguing for/against a claim, B, that is mutaully exclusive of the protagonist's earlier claim, A. If the protagonist had been against, A, then the antagonist will be against B. It is in this routine where we see conversants using logic rules like: "Exclusive-OR-MTP," "Modus Tollendo Ponens," and the like.

Note: Deciding whether to indirectly attack a previous claim or, if given, evidence of that claim.

```
If CCS.SupportCS NE Nil
  Then Choose(1: No-Op

    2: space <- CCS
      Push Generating-Space
      CCS <- Last(CCS.SupportCS)
      CCS.State <- "Active")

  Else If CCS.Goal = "Support"
    Then Choose(3: No-Op

      4: space <- CCS
        Push Close-Space
        CCS <- HEAD-CCS
        CCS.State <- "Active"
        HEAD-CCS <- Nil)
```

Step 2:

Note: Generating appropriate clue words for an indirect challenge.

If Type-Further-Challenge = Nil
 & Expectation.Associated-Constraints NE "Suply-Support-Rejection"

Then Speaker EXPRESS ("Yes/Right, but,") ("Except, however") ("But")

Note: Constructing new challenge space.

If CCS.Modality = "Evaluative"
 OR
 HEAD-CCS.Modality = "Evaluative"
 Then nc <- Push New-Challenge-EI
 Else nc <- Push New-Challenge-EPI

Push Update-Support-Analogy-Challenge

Note: Choosing whether to preface substantive claim with an authority support.

Choose(1: Speaker EXPRESS "It's well known that," or the like

2: Push Cite-Authority
 CCS.SupportCS <- *
 Speaker EXPRESS *.Authority.Source
 {Showed/Demonstrated/Claimed, etc.} that
 3: No-Op)

Note: Choosing an appropriate form of indirect challenge.

Choose (1: If HEAD-CCS.Modality = "Evaluative"
 Then Push Mutually-Exclusive-Evaluative
 2: If HEAD-CCS.Modality = "Evaluative"
 Then Push Implicit-Mutually-Exclusive
 space <- CCS
 push Close-Space
 CCS <- HEAD.CCS
 CCS.State <- "Active"
 HEAD-CCS
 <- For Some I,
 HEAD-CCS.Co-Relator{I}
 S.T. Contextual-Function{I}
 NE "Inference-Of"/"Derived-From"
 HEAD-CCS.State <- "Controlling"
 3: If HEAD-CCS.Contextual-Function.Function

```

= "Implicit-Mutually-Exclusive"
OR
"Mutually-Exclusive-Evaluative"
Then Push "Comparative-Evaluative"

4: If CCS.Modality = "Epistemic"
& HEAD-CCS.Claim.Epistemic-Predicate = "Not-True"
Then Push Modus-Tollendo-Ponens

5: If CCS.Modality = "Epistemic"
& HEAD-CCS.Claim.Epistemic-Predicate = "True"
Then Push EXCLUSIVE-OR-MTP

6: If CCS.Modality = "Epistemic"
Then Push Contrast)

```

Step 3:

Note: Append Challenge onto Countersupports/CounterClaims slot of issue space just challenged.

```

(For Some I,
  CCS
  APPEND
  (If HEAD-CCS.Goal = "Support"
    &
    HEAD-CCS.Contextual-Function.Method NE "Analogy"
    Then HEAD-CCS.Contextual-Function.Co-Relator{I}
      .CounterSupports
    Else CCS.Contextual-Function.Co-Relator{II}
      .CounterClaims)

  S.T. CCS.Contextual-Function.Method{I}
    NE "Derived-From" OR "Inference-Of")

```

(POP)

Concede-Subargument

Step 1:

Choose (1: Speaker EXPRESS Agreement-Word, such as "Okay"/"Allright"/
 2: Speaker EXPRESS "Oh, another thing" or the like
 3: NO-Op)

Step 2:

Choose (1: Go End-Debate
 2: Speaker EXPRESS "But"
 3: No-Op)

Step 3:

Note: A challenger's counter claim & evidence, if any, are accepted.
 Put these contexts in "closed" states to reflect that no further argumentation of these spaces is expected.

```
If CCS.Goal = "Support"
  Then space <- CCS
    Push Close-Space
    HEAD-CCS <- space
    Push Close-Space
    Intervening-Subarguments <- (CCS,HEAD-CCS)

  rejected-space <--
  if HEAD-CCS.Goal = "Fix-Claim"
    Then HEAD-CCS.Co-Relator.Co-Relator
    Else HEAD-CCS.Co-Relator

Else space <- CCS
  Push Close-Space
  Intervening-Subarguments <- (CCS)
  rejected-space <-- HEAD-CCS
```

Step 4:

Note: If what was rejected (& accepted as invalid or irrelevant) was a support of a claim, then the speaker may still salvage this initial claim by giving better support of it, i.e., one not open to previous criticisms.

```
If rejected-space.Goal = "Support"
  Then Choose (1: Push Implicit-Concessions
    CCS <-- rejected-space
    HEAD-CCS <-- CCS.Co-Relator
    HEAD-CCS.State <-- "Controlling"
    Type-Further-Challenge <- "Support"
    Go Further-Challenge-Support/step 3

  2: No-Op)
```

Step 5:

```
CCS <- rejected-space
Expectation <- Choosed(Expectation-List)
S.T. Expectation.Function = "Further-Challenge" &
      Expectation.Speaker = Speaker
      OR
      Expectation.Speaker MEMBER Side{i}(Sides)
      S.T. Speaker MEMBER Side{i}(Sides)
```

Go Further-Challenge/Step 3

Further-Challenge/Step 1:

```
Choose (A: Push Shift-Speaker-Expectation
        B: knownside <- Expectation.Speaker
            push Shift-Speaker-Sameside/Step 1)
```

Step 2:

Speaker EXPRESS "And, furthermore"/"And"/ etc.

Step 3:

```
irrelevant-context <- CCS
Push Find&DeleteExpectations-Irrelevant-Contexts/Step 1
```

Step 4:

Future-Defender <- Oneof(Expectation.Context.Protagonists)

Choose

```
(A: If For Some I,J
    (Expectation.Context.CounterClaims{I}
     OR
     Expectation.Context.CounterSupports{I})
     MEMBER
     Intervening-Subargument
     &
     Expectation.Context.CounterClaims/CounterSupports{I}
     .SupportCS{J}
     NE Nil
Then HEAD-CCS <- Expectation.Context
      .CounterClaims/CounterSupports{I}
```

```

HEAD-CCS.State <- "Controlling"
CCS <- HEAD.CCS.SupportCS{J}

HEAD-CCS DELETE Intervening-Subargument
CCS DELETE Intervening-Subargument
All Expectations on Expectation-To-Be-Deleted List
with Context = HEAD-CCS
APPEND
Expectation-List
Type-Further-Challenge <- "Support"

B: CCS <- Expectation.Context
   CCS.State <- "Active"
   Type-Further-Challenge <- "Challenge")

```

Step 5:

```

REPEAT space <- Next-Of(Intervening-Subargument)
  Push Close-Space
UNTIL space = Nil

If Update-Constraints NE Nil
  THEN Push Implicit-Concessions
Intervening-Subargument <- Nil
Expectations-To-Be-Deleted <- Nil
Go Further-Challenge-Support/Step 3

```

Further-Challenge-Support/Step 1

```

Choose ( A: knownside <- Speaker
         push Shift-Speaker-Sameside

B: Go Step 2 )

```

Step 2:

Speaker EXPRESS "And"/"And, furthermore"/etc.

Step 3:

```

If Type-Further-Challenge = "Support"
Then Choose(A: Same-Principle <- True

```

```

B: If CCS.Authority NE Nil
   The Same-Authority <- True

```

C: If CCS.Authority NE Nil
Then Same-Authority <- True
Same-Principle <- True

D: Same-Principle <- Nil
Same-Authority <- Nil)

If CCS.State NE "Closed"
Then push Close-Space
CCS <- HEAD-CCS
Go Support-Choice/Step 2

Else Go Challenge-Choice/Step 2

Challenge-Support-Specifics:

Choose(A: Go Challenge-Basis-Support

B: Go Challenge-Authority)

Challenge-Basis-Support:

NOTE: Antagonist invalidates protagonist's supporting evidence by attacking its reliance on an inapplicable or falacious support-principle.

Choose(A: Go Challenge-Mappings/Step 1

B: Go Challenge-Scope/Step 1

C: Go Challenge-Validity/Step 1)

Analogy-Choice:

Step 1:

Note: Creating analogy issue context space, and getting next speaker.

rcontextual-function <-- [
co-relator <-- CCS]

```
If CCS.Modality = "Evaluative"
  Then nc <-- Push Construct-New-Analogy-EIS
  Else nc <-- Push Construct-New-Analogy-Epic
```

Push Update-Support-Analogy-Challenge

Choose (1: Go Analogy

2: Push Shift-Speakers
 Go Analogy)

(2) Basic Substantive RoutinesAnalogy:

Step 1:

Note: Before beginning an analogous context space a speaker usually prefaces his/her remarks with "It's like," "It's the same as,"

CCS.Contextual-Function.Function <- "Analogy"

Choose(1: Speaker EXPRESS "It's like/the same as/as if, etc.

2: No-Op)

Step 2:

If HEAD-CCS.Modality = "Epistemic"

Then Speaker EXPRESS proposition, P,

S.T. Epistemic-Claim(P) &

Epistemic-Predicate(P)

= HEAD-CCS.Claim.Epistemic-Predicate

&

NotNull(Z <- ANALOGIZE(State-of-Affairs(P),
HEAD-CCS.Claim.State-of-Affairs,
HEAD-CCS.Abstract))

OR

Speaker EXPRESS some Preposition & Nominal,N

S.T. For Some I, ith-nominal(HEAD-CCS.Claim,I) & N

are mutually exclusive subsets of

some larger set S.

Choose(1: For some P, Infer some Epistemic-Claim(P)

S.T. P.Epistemic-Predicate

= HEAD-CCS.Claim.Epistemic-Predicate

&

NotNull(Z <- ANALOGIZE(
P.State-of-Affairs,
HEAD-CCS.Claim.State-of-Affairs,
HEAD-CCS.Abstract))

2: Speaker EXPRESS Some Proposition Q
 S.T. Assuming P <-- Preposition stated
 "it is the case that" Q
 Then Epistemic-Claim(P) &
 P.Epistemic-Predicate
 = HEAD-CCS.Claim.Epistemic-Predicate
 &
 NotNull(Z <--
 ANALOGIZE(
 P.State-of-Affairs,
 HEAD-CCS.Claim.State-of-Affairs,
 HEAD-CCS.Abstract))

Where ANALOGIZE(X,Y,Z)

Returns a nonnull value if there is a mapping
 of objects in X to corresponding objects in Y, and both X & Y
 can be described in terms of a more abstract proposition.
 If the third argument, Z, to analogize is Nil then the nonnull
 value returned will be a new abstract proposition created
 by this routine. If, however, the input value bound to Z
 is not null, then the appropriate abstract relating X & Y must
 be this input or a generalization of it.
 If this is not the case then ANALOGIZE(X,Y,Z) will return null.

If we call the nonnull abstract under which the correspondence
 holds Z, then, X will correspond to z, by mapping elements
 X{1}... X{n} of X to elements Z{1}...Z{n} of Z, whose
 instantiation under correspondence is Y, by mapping elements
 Y{1}...Y{n} of Y to elements Z{1}...Z{n} of Z, where
 Y{1}...Y{n} are the elements corresponding to X{1} ... X{n}.

The nonnull value returned will be composed of constants and
 variables. Constants are
 for those X{i}, Y{i} that are identical. Variables are for
 those X{i}, Y{i} that are not identical. In these cases, Z{i}
 will be the set description of which X{i},Y{i} form mutually
 exclusive subsets.

All the X{i},Y{i}, and Z{i}, for i > 1 may be composites,
 where composites are done according to syntactic embeddings.

Step 3:

Note: Add additional slot values to CCS

```
Mappings <-- ((Z{i} in Z
                  X{i} in P.State-of-Affairs
                  Y{i} in HEAD-CCS.Claim.State-of-Affairs)) For All i in Z
```

Abstract <-- Z
Claim <-- P

If CCS.Contextul-Function.Function
= Oneof("Contrast", "Pre-Generalization")

Then Go Produce-Next-Move

Step 4:

Note: In other cases of analogy construction, we create the expectation
of returning to the initiating subject of the analogy.

Expectation <-- [
Function <-- "Relate-Analogy"
Speaker <-- Speaker
Context <-- HEAD-CCS]

Expectation APPEND Expectation-List
Expectation <-- nil

Go Produce-Next-Move

Direct Challenges

Emotive-Flat-Rejection:

Step 1:

Note: The new antagonist counters the previous arguer's statements by
dismissing the import of his/her statements.

Note: Setting registers & constructing new comment context space.

rgoal <-- "Challenge"
rcontextual-function <-- [
function <-- "Emotive-Flat-Rejection"
co-relator <-- CCS]

Push Construct-New-Comment

Note: * has identifier of new comment space.

CCS.Comment <- *

Speaker EXPRESS some Emotive-Utterance, P,

S.T. The emotive content of the utterance reflects boredom.
where, boredom is the value of emotive statements such as:

"So what"
"Big deal"
"That means nothing"
"That doesn't impress me"

Note: Add additional slots to CCS & CCS.Comment

CCS.Comment.Claim <- P

(POP)

Irrelevance Rejection:

Step 1:

Note: Antagonist does not deny the truth of a protagonist's preceding statements, but rather, denies its relevance to the issue at hand.

Note: Setting registers & constructing a new comment space.

rgoal <- "Challenge"
rcontextual-function <- [
function <- "Irrelevance-Rejection"]
co-relator <- CCS

Push Construct-New-Comment

Step 2:

Speaker EXPRESS proposition, P

S.T. P = Irrelevant G in X
where: X = CCS.Topic &
G PART CCS.Claim.State-of-Affairs

Step 3:

Note: Add additional slot values to CCS & CCS.Comment

CCS.Comment <- *

CCS.Comment.Claim <- P

Choose(1: (POP)

2: Note: Citing relevant factor, which, presumably, antagonist feels protagonist has not yet proven for the case at hand.

Push Convert-Comment-Issue
space <- CCS
Push Controlling-Space

Note: Adding values to New Issue space

*.Mode <- "Explicit"
*.State <- "Active"
CCS <- *

Speaker EXPRESS Proposition, P
S.T. P = Relevant G' in X

where Orthogonal(G,G') = True
or
Larger-Scope(G,G'))

Step 3:

Note: Add additional slot values to CCS.

Setslots(CCS)

Contextual-Function <-
Function <- If Larger-Scope(G,G')
Then "Irrelevance-by-Expansion"
Else "Irrelevance-by-Orthogonal"]

Claim <- Epistemic-Claim(P)

(POP CCS)

Demand-Support-Rejection:

Step 1:

Note: Add challenge comment onto "Oldcomments" slot and destroy link to a separate comment space.

CCS.Comment.Claim

APPEND

CCS.Oldcomments

CCS.Comment <- Nil

Note: The speaker here expresses a "why" question that demands that the previous speaker give supportive evidence of his/her previous emotive rejecting metastatement. This is in essence a demand for a substantive challenge.

Speaker EXPRESS "Why"/"Why not"

Step 2:

Note: Note that on the next turn the previous speaker (who is currently assigned the Future-Defender role) is expected to supply cause for his/her flat rejection.

Expectation.Associated-Constraints <-- "Supply-Support-Rejection"

(POP)

Demand-Support-Claim:

Step 1:

Note: Antagonist expresses a "how" or "why" question that demands that the protagonist give supportive evidence of a previous made claim.

Choose(1: If CCS.SupportCS.Authority NE Nil

Then Speaker EXPRESS

"how did" CCS.SupportCS.Authority.Source
show/demonstrate/evidence/etc. that

2: Speaker Express

Choose(1: "Why" (do you believe that)
(is that true)

2: "Why not?"

3: "How do you know that?")

Step 2:

Note: Setting note that the challenged conversant is expected to

supply supportive evidence of her/his previous claim.

Expectation.Associated-Constraints <- "Supply-Support-Claim"
(POP)

New-Factor:

Step 1:

Note: In this option, an antagonist does not deny the truth of a protagonist's statements, but rather, mentions an attribute of an entity contained in the protagonist's claim (usually its subject) s.t. this attribute either implies that the protagonist's claim is not true for this entity (as a result of its having this attribute) or it undermines the general evaluative import of the protagonist's claim this case where the entity involved has such an attribute.

Note: Attribute implies protagonist's claim untrue (or irrelevant) as regarding specific entity under discussion.

Speaker EXPRESS Proposition, P

S.T. Predicate(P,X,Y)
Where Y PART/General(PART) HEAD-CCS.Claim.State-Of-Affairs
or
HEAD-CCS.Support-Fact
&
Y with attribute X Implies Z
where If HEAD-CCS.Modality = "Epistemic"
Then Epistemic-Predicate(Z) =
NEG(HEAD-CCS.Claim.Epistemic-Predicate
&
State-of-Affairs(Z) =
= HEAD-CCS.Claim.State-of-Affairs
with added predication X on Y

Else If HEAD-CCS.Goal = "Support"
Z = Neg(Q(Y)) Where Q(Y)
In HEAD-CCS.Support-Fact

Step 2:

Note: Add additional slot values to ccs.

```

Contextual-Function <-- [
  Function      <-- "New-Factor"]
  Claim         <-- Z

If Y = General(Part(HEAD-CCS))
  Then ("Rderived", HEAD-CCS) APPEND CCS.Contextual-Function
(POP)

```

Irrelevant-Factor:

Step 1:

Note: Signification of irrelevance of challenger's predication of attribute by repetition of same initial claim with predication incorporated into claim.

Speaker EXPRESS Proposition, P

S.T. P = HEAD-CCS.Co-Relator.Claim With Added (P, X, Y)
 where X(Y) PART HEAD-CCS.Claim.State-of-Affairs
 &
 Y is usually the Subject(HEAD-CCS.Co-Relator.State-of-Affairs)

Step 2:

Note: Add additional slot values to CCS.

Setslots(CCS)

```

Contextual-Function <-- [
  Function      <-- "Irrelevant-Factor"
  Function      <- "Strength"
  Co-Relator   <- HEAD-CCS.Co-Relator]
  Claim         <-- P

```

Note: Initial claim now strengthended and explicitly stated to apply to presumed exempt case brought up by the antagonist.

HEAD-CCS.Co-Relator.State <- "Superceded"
 HEAD-CCS.Co-Relator.Contextual-Function <- ("Expanded-By", CCS)
 Delete any expectations with context = HEAD-CCS.Co-Relator
 from Expectation-List

(POP)

Range-Application:

Step 1:

Note: In this case, the antagonist does not totally deny the validity of a protagonist's claims, but rather, s/he states that what is being claimed is true so few of the times that it should basically be discounted and considered irrelevant or untrue.

Speaker EXPRESS SA1 "But" in general SA2
(Therefore forget SA1)

S.T. SA1 = For some X True(HEAD-CCS.Claim)
or
For some X True SA3 where SA3 SUBSUME HEAD-CCS.Claim
&

Epistemic-Claim(SA2)
S.T.
SA2.State-of-Affairs = HEAD-CCS.Claim.State-of-Affairs
OR
SA2.State-of-Affairs SUBSUME HEAD-CCS.Claim.State-of-Affairs
&
SA2.Epistemic-Predicate
= NEG(HEAD-CCS.Claim.Epistemic-Predicate)

Note: Add additional slot values to ccs.

Setslots(CCS)

Contextual-Function <-- [
Function <-- "Range-Application"]
Claim <-- SA2

(POP)

Deny-Truth:

Step 1:

Note: Antagonist explicitly denies total validity of protagonist's claims.

Speaker EXPRESS proposition, P

S.T. Epistemic-Claim(P) &
State-of-Affairs(P) = HEAD-CCS.Claim.State-of-Affairs
Epistemic-Predicate(P) = NEG(HEAD-CCS.Claim.Epistemic-Predicate)

Step 2:

Note: Add additional slot values to CCS.

Setslots(CCS)

Contextual-Function <-- [
Function <-- "Deny-Truth"
Claim <-- P

(POP)

Challenge-Analogy-Mappings/Step 1:

Choose

(A: Speaker EXPRESS Propositions A,B

S.T. For Some I,J,
For Some Relation, R{K+1}
A ASSERTS True(Analogous-Space.Mappings.X{I}
R{K+1}
Analogous-Space.Mappings.X{J})

AND

B Asserts NotTrue(Analogous-Space.Mappings.Y{I}
R{K+1}
Analogous-Space.Mappings.Y{J})

S.T.

(True(Analogous-Space.Mappings.Z{I}
R{K+1}
Analogous-Space.Mappings.Z{J}))

Enable/Cause/Important-To

Analogous-Space.Abstract.Relations(K))

B: Speaker EXPRESS Proposition A

S.T. For Some I,J,K,L

A Predicate Q on Analogous-Space.Mappings.X{J}

S.T.

Possible(Infer Relation Set, (R{K+1} ... R{K+L}))

S.T. Q Implies

1. True(R{K+1} ... R{K+L}) In X{Max}
 - &
 2. Not(True(R{K+1} ... R{K+L})) In Y{Max}
- WHERE
- 1 & 2 Imply Not(Possible(Analogous.Space.Goal))

Step 2:

Setslots(CCS)

```
Contextual-Function <-- [  
    <-- Challenge-Analogy-Mappings]  
Claim <-- [  
State-Of-Affaris <-- A,B  
Epistemic-Predicate <-- True]
```

(POP)

Challenge-Mappings:

Note: The antagonist decides to invalidate the protagonist's argument by showing that the principle used by the protagonist to support his/her facts as valid argumentation, was inappropriately used as the presuppositions underlying the principle and which are necessary to make it valid, are not true in the application.

Speaker EXPRESS some Proposition, P

S.T. For Some SA2 [Possible(Infer(Implication(P) = SA2))
OR
Let SA2 = P]

S.T. For Some I, For Some Predicate, PR,
[SA2 DENY True(PR(HEAD-CCS.MAPPINGS.Y{I}))
WHERE
(True(PR(HEAD-CCS.MAPPINGS.X{I}))
Presupposition-Of
HEAD-CCS.Support-Principle)

Step 2:

Setslots(CCS)

```
Contextual-Function <- [
  Method           <- "Challenge-Mappings"]
  Claim            <- Epistemic-Claim(P)
```

(POP)

Challenge-Scope:

Note: Antagonist's attack rests on the claim that the protagonist's support-principle used was overgeneralized to cover a class of objects under which it does not hold.

Speaker EXPRESS some Fact, F,

```
S.T. F Implies F'
S.T. F' Implies HEAD-CCS.Support-Principle
  Only True for P(Z)
  where Z = Some HEAD-CCS.ThenMappings.X{I}
  & where HEAD-CCS.ThenMappings.Y{I} is not restricted to P(Y{I})
```

Step 2:

Note: Add additional slot values of CCS.

Setslots(CCS)

```
Claim          <-- [
  State-Of-Affairs <- F.State-Of-Affairs
    Implies
    P(Z)
  Epistemic-Predicate <- True]
  Contextual-Funciton <-- [
    Fucntion        <-- "Challenge-Scope"]
```

(POP)

Indirect Challenges

Contrast:

Step 1:

Speaker EXPRESS "On the other hand"/"At the opposite extreme"/
"You have the other extreme"/etc.

If CCS.Function "Analogy"
Then delete any expectation on Expectation-List
with context = HEAD-CCS & Function = "Relate-Analogy"

Go Analogy/Step 2

EXCLUSIVE-OR-MTP

Step 1:

Note: The antagonist uses the following general inference rule:
Given: A Exclusive-OR B
Showing: B
Proves: Not(A)

The context for this type of argumentation is the following:
A protagonist has asserted A. The antagonist, rather
than directly claiming not A, claims B. If B is accepted,
then the protagonist's claim of A is rejected.

Speaker EXPRESS Proposition, P

S.T. 1. Epistemic-claim(P)
2. P.Epistemic-Predicate = "True"
3. HEAD-CCS.Claim.State-of-Affairs
 Exclusive-Or P.State-of-Affairs

Step 2:

Note: add additional slot values to ccs.

Contextual-Function <-- [
Function <-- "EXCLUSIVE-OR-MTP"]
Claim <-- p

(POP)

Modus-Tollendo-Ponens

Step 1:

Note: The rule of logic being used here is:

Given: A EXCLUSIVE-OR B
 Showing: Not(B)
 Proves: Not(A)

The context for this type of argumentation is the following:
 The protagonist has asserted Not(A). The antagonist,
 rather than directly claiming A, claims Not(B). If Not(B)
 is accepted, then the previous claim of Not(A) is rejected.

Protagonist: "A is not true"
 Antagonist: "B is not true"
 A EXCLUSIVE-OR B So A must be true.⁹²

Speaker EXPRESS EPISTEMIC-CLAIM P,
 S.T.
 P.Epistemic-Predicate = "Not-True"
 & Possible(Believe(
 (P.State-Of-Affairs
 EXCLUSIVE-OR
 HEAD-CCS.Claim.State-Of-Affairs)
 OR
 (General(P.State-Of-Affairs
 EXCLUSIVE-OR
 (General(HEAD-CCS.Claim.State-Of-Affairs))))

Step 2:

Note: Add additonal slot values to ccs.

Setslots(CCS)

Contextual-Funciton <- [
 Function <- "Modus-Tollendo-Ponens"]
 Claim <- P

⁹² It is possible that this move in some discourse contexts should be thought of as a support move rather than a challenge move. In particular, challenging a negative epistemic-claim usually occurs in the context where the negative epistemic being challenged is itself a challenge to a positive assertion of this same claim. Hence, using Modus-Tollendo-Ponens really supports the initial assertion of the positive epistemic-claim. In this version of the grammar, however, even where we have such a preceding discourse context, I continue to treat this move as a challenge, rather than as an indirect support move.

(POP)

Accept & Apply Expansion

Step 1:

Note: Antagonist does not deny the truth of protagonist's preceding statements, but rather, claims that her/his own preceding statements (i.e., those prior to the protagonist's) do address themselves to the expanded issue brought up by the protagonist.

Speaker EXPRESS Fact, F,

S.T. F = G' = G(X)

Where G' = CAR(Expectation.Associated-Constraints)

G = CADR(Expectation.Associated-Constraints)

X = CDDR(Expectation.Associated-Constraints)

OR

S.T. If HEAD-CCS.Co-Relator.SupportCS NE Nil

Then For some I, J, K

F = CAR(Expectation.Associated-Constraints)

TRUE-OF

HEAD-CCS.Co-Relator{J}.SupportCS{K}

.Support-Fact.Element{I}

where Element{I} corresponds by class membership
to CDDR(Expectation.Associated-Constraints)

CCS.Contextual-Function

APPEND

Function <-- "Derived-From"

Co-Relator <-- HEAD-CCS.Co-Relator{J}.SupportCS{K}

Step 2:

Note: Add additional slot values to ccs

Setslots(ccs)

Claim <-- Epistemic-Claim(F)

Contextual-Function <- [

"Apply-Expansion"]

(POP)

Implicit-Mutually-Exclusive

Note: The antagonist will implicitly argue that the state-of-affairs advocated by the protagonist has the same negative evaluative as the state-of-affairs condemned by the protagonist.

Infer some Evaluative-Claim, EC,
 S.T. EC.State-of-Affairs
 = Neg(HEAD-CCS.Claim.State-of-Affairs)
 EC.Dimension
 = HEAD-CCS.Claim.Evaluative-Predicate.Polarity
 EC.Polarity
 = HEAD-CCS.Claim.Evaluative-Predicate.Polarity

Note: Add additional slot values to CCS.

Setslots(CCS)

```
Contextual-Function <-- [  

  Function <-- "Mutually-Exclusive"]  

  Mode <-- "Implicit"  

  Claim <-- EC  

  Advocated-Inference <-- Neg(HEAD-CCS.Advocated-Inference)
```

Push Support-Choice/Step 2

(POP)

Evaluative-Implication

Note: The speaker supports an evaluative claim by stating a state-of-affairs whose evaluative implication is the same as the claim being supported, and which follows from the state-of-affairs being evaluated in the first place.

```
Speaker EXPRESS (by SA1) SA2  

  Where SA1 = HEAD.CCS.Claim.State-of-Affairs  

    OR  

    (HEAD-CCS.Claim.State-of-Affairs  

      IMPLY SA1)  

    &  

    If Same-Principle NE Nil  

      Then EP <- Last(HEAD-CCS.SupportCS)  

        Same-principle <- Nil  

      Else EP <- Infer some Evaluative-Principle, EP,
```

```

&
EP.Polarity = HEAD-CCS.Claim.Evaluative-Predicate.Polarity
&
HEAD-CCS.Claim.State-of-Affairs
    IMPLY
EP.State-of-Affairs
&
SA2 INSTANCE EP.State-of-Affairs

```

Step 2:

Note: Fill in additional slots of CCS.

Setslots(CCS)

```

Support-Fact      <- SA2
Support-Principle <- EP
Mappings          <- (X{i} in SA2, y{i} in EP)
                    S.T. SA2 Instance EP.State-of-Affairs
Contextual-Function <- [
    Function        <- "Evaluative-Entailment"]

```

(POP)

Modus-Tollens:

Step 1:

Note: The logic rule used here is:

```

Given: A IMPLIES B
Showing: Not(B)
Results: Not(A)

```

Speaker EXPRESS Fact, F

S.T.

If Same-Principle = True

```

Then If-Then-Principle <- Last(HEAD-CCS.SupportCS).Support-Principle
Else If-Then-Principle <- Infer some generic If-Then Principle

```

Where, for both,

```

F INSTANCE Not(Thenpart(ITP))
&
HEAD-CCS.Claim.State-Of-Affairs
    INSTANCE
    Ifpart(ITP)

```

Step 2:

Note: Add additional slot values to CCS.

Setslots(CCS)

```

Mappings <-- [
  ThenMappings <-- (X{I} In Thenpart(ITP), Y{I} In F)
    S.T. F INSTANCE Not(Thenpart(ITP))
  IfMappings <-- (A{I} In Ifpart(ITP),
    Z{I} In HEAD-CCS.Claim.State-Of-Affairs
    S.T. HEAD-CCS.Claim.State-Of-Affairs
    INSTANCE
    Ifpart(ITP))
  Contextual-Function <-- [
    Function <-- Modus-Tollens]
  Support-Principle <-- ITP
  Support-Fact <-- F
]

(POP)

```

Modus-Ponens:

Step 1:

Note: The rule of logic used here is Modus-Ponens. i.e.,

```

Given: A IMPLIES B
Showing: A
Proves: B

```

Speaker Express Fact, F
S.T. If Same-Principle

```

  Then ITP <-- Last(HEAD-CCS.SupportCS).Support-Principle
  Else ITP Infer If-Then-Principle

```

And For both it must be the case that:

```

  F INSTANCE ITP.IfPart
  HEAD-CCS.Claim.State-of-Affairs INSTANCE ITP.ThenPart

```

Step 2:

Note: Add additional slot values to ccs.

Setslots(CCS)

```
Support-Principle <- ITP
Support-Fact      <- F
Mappings          <-- ( (X{i} in F, Y{i} in ITP.IfPart)
                      (X{i} in HEAD-CCS.Claim.State-of-Affairs),
                      Y{i} in ITP.ThenPart) )
```

S.T. F INSTANCE ITP.IfPart

```
HEAD-CCS.Claim.State-of-Affairs
INSTANCE
ITP.Thenpart
```

```
Contextual-Function <-- [
  Function          <-- Modus-Ponens]
```

(POP)

Cite-Authority:

Step 1:

Note: Citing source of claim and possibly access to this source.

If CCS.Goal NE "Support"
Then Push Construct-Support-Space

Speaker EXPRESS some fact, F,
S.T. F cites a source of information and/or the speaker's access to
that information.

Setslots(*)

```
Authority <- [
  Source <-- source mentioned in F
  Access <-- access mentioned in F]
```

Step 2:

Note: Deciding whether to give credentials of informant.

Choose (1: (POP *))

2: Speaker EXPRESS some predication, P, on CCS.Authority.Source
S.T. P cites credentials or reason for respecting source.

CCS.Authority.Credentials <-- P

(POP #))

Relate-Analogy:

Step 1:

Note: If analogous space has interveningly been supported, close it.

```
If CCS.Goal EQ "Support"
Then   space <- CCS
      Push Close-Space
      CCS <- HEAD-CCS
      HEAD-CCS.State <- "Active"
      HEAD-CCS <- CCS.Contextual-Function.Co-Relator{I}
                  S.T. Function{I} NE "Inference-Of"/"Derived-From"
```

Note: After giving an analogy, one can first generalize onto the abstract principle upon which the analogy is based, or one can directly return to the initiating space of the analogy.

```
Choose(1: If CCS.Contextual-Function{I} = "Analogy"
        THEN
          rgoal           <-- "relate-analogy"
          rcontextual-function <- [
            function       <-- "Generalization"
            co-relator    <-- HEAD-CCS]

        If HEAD-CCS.Modality = "Epistemic"
          Then Push Construct-EPI
          Else Push Construct-EI

        Re-Enter <- True
        nc <- *
        Push Update-Support-Analogy-Challenge
        RE-Enter <- Nil

        Speaker EXPRESS Proposition, P
        S.T. (If HEAD-CCS.Modality = "Epistemic"
              Then Epistemic-Claim(P) &
                  P.Epistemic-Predicate
                  = HEAD-CCS.Epistemic-Predicate

              Else Evaluative-Claim(P) &
                  P.Evaluative-Predicate
                  = HEAD-CCS.Evaluative-Predicate)
```

&

P.State-of-Affairs = HEAD-CCS.Abstract
OR
P.State-of-Affairs = HEAD-CCS.Abstract

Note: Add additional slot values to ccs.

Claim <-- P

Note: Close the analogous context space.

space <- HEAD-CCS
Push Close-Space

Note: Reinstantiate Initiating space as Controlling

HEAD-CCS <- HEAD-CCS.Contextual-Function.Function{I}
S.T. Function{I} NE "Derived-From"/"Inference-Of"
HEAD-CCS.State <- "Controlling"

Note: If in debate mode add possible new challenge
expectation for new claim.

If Discourse-Mode = "Debate"
Then Expectation <-- [
 Function <-- Challenge-Choice
 Speaker <-- Future-Defender
 Context <-- CCS]
Expectation APPEND Expectation-List
Expectation <-- Nil

Choose(A: No-Op

B: Expectation <-- [
 Function <-- Relate-Analogy
 Speaker <-- Speaker
 Context <-- HEAD-CCS]
Expectation APPEND Expectation-List)
expectation <-- nil
Re-Enter <- True
Go Produce-Next-Move)

2: No-Op)

Step 2:

```
If Expectation.Context NE HEAD-CCS
Then rejected-space <- CCS93
Push Find&Delete-Expectations-Irrelevant-Contexts
Repeat space <- Next-Of(Intervening-Subargument)
    Push Close-Space
    UNTIL space = Nil

Else space <- CCS
    Push Close-Space)

CCS <- Expectation.Context
CCS.State <- "Active"
```

Choose(1: No-Op

2: Speaker EXPRESS "And the only difference/important
thing here is")

```
Speaker EXPRESS Proposition, P,
S.T. If CCS.Modality = "Epistemic"
    Then Epistemic-Claim(P)
    Else Evaluative-Claim(P)
&
P.State-of-Affairs = Oneof(CCS.Claim.State-of-Affair)
```

Go Produce-Next-Move

⁹³Same routine and operation of closing intervening discussion; just name of register slightly inappropriate here. In next re-write, will use a more general name for this register, similarly will call Intervening-Subarguments, the Intervening-Discussion register.

(3) Basic Constructive RoutinesShift-Speakers:

```
oldspeaker <- Speaker
Speaker <- Choosed(Participant-List)
oldspeaker APPEND Participant-List
(POP)
```

Shift-Speaker-Expectation:

```
If Expectation.Speaker NE Speaker
Then Speaker APPEND Participant-List
    Speaker <- Expectation.Speaker
    Speaker DELETE Participant-List
(POP)
```

Shift-Speaker-Sameside/Step 1:

```
For Some I,
Current-Side <- Side{I} S.T. knownside MEMBER Side{I}

If Current-Side NE (knownside))
Then Choose(A: Go Step 2

    B: Speaker <- Oneof(Current-Side)
        S.T. Speaker NE knownside
        Speaker DELETE Participant-List
        knownside APPEND Participant-List
        (POP) )
```

Step 2:

```
Sides APPEND Oldsides

Speaker <- Choosed(Participant-List)
    S.T. Speaker NE knownside
    &
    Not(Speaker MEMBER Current-Side)

Speaker APPEND Side{I}(Sides)
knownside APPEND Participant-List
```

```
If For Some J NE I,
  Speaker MEMBER Side{J}(Sides)
Then Speaker DELETE Side{J}(Sides)

(POP)
```

Find&Delete-Expectations-Irrelevant-Contexts/Step 1:

Note: Traverse network links of constructed context spaces from the current space until the one popping back to. Record the identifiers of all intervening spaces onto the Intervening-Subarguments register.

```
Delete All Expectations of Expectation.List
with Context = irrelevant-context
& APPEND them onto the Expectations-To-Be-Deleted List
```

```
irrelevant-context APPEND Intervening-Subarguments
irrelevant-contexts-list
  <- irrelevant-context.Contextual-Function.Co-Relators
```

Step 2:

```
irrelevant-context <- Choosed(irrelevant-contexts-list)

If irrelevant-context = Nil
  Then (POP)

If irrelevant-context NE Expectation.Context
  &
  irrelevant-context.State
  NE "Closed" OR "Superceded"
  &
  Not(irrelevant-context MEMBER Intervening-Subargument)
Then Push Close&Delete-Expectations-Irrelevant-Contexts
  Go Step 2
Else Go Step 2
```

Update-Support-Analogy-Challenge::

```
If Re-Enter = True
  Then HEAD-CCS.State <- "Controlling"
Else If HEAD-CCS NE Nil
  Then space <- HEAD-CCS
```

```
push Generating-Space  
CCS.State <- "Controlling"  
HEAD-CCS <- CCS
```

```
CCS <- nc  
CCS.State <- "Active"  
(POP)
```

Generating-Space:

```
space.State <- "Generating"  
space.Focus.High APPEND space.Focus.Medium  
space.Focus.High <- Nil  
(POP)
```

Close-Space:

```
space.State <- "Closed"  
space.Focus.Zero <- (space.Focus.Zero, space.Focus.Low,  
                      space.Focus.Medium, space.Focus.High)  
space.Focus.High <- space.Focus.Medium <- space.Focus.Low <- Nil  
Delete any expectations on Expectation-List with Context = space  
(POP)
```

New-Challenge-EPI:

```
rcontextual-function <- [  
  co-relator <- CCS]  
  rgoal <- "Challenge"  
  rmode <- "Explicit"  
  
Push Construct-EPI  
(POP *)
```

New-Challenge-EL:

Step 1:

Note: Setting registers & constructing a new evaluative

issue context space.

```
rcontextual-function <-- [
    co-relator      <-- CCS]
    rgoal          <-- "Challenge"
```

Push Construct-Ei

(POP *)

Construct-Support-Space:

```
ridentifier <-- Construct-Empty-Support-Space
```

Setslots(ridentifier)

```
Goal <-- "Support"
Contextual-Function <-- [
    Co-Relator      <-- CCS]
    Supporter       <-- Speaker
```

(POP ridentifier)

Check-Probable-Space:

Step 1:

```
If probable-space.State NE "Superceded"
    Then POP probable-space
Else probable-space <-- probable-space.Co-Relator{I}
    S.T. Function{i} NE "Constrained-By"
Push Check-Probable-Space
(POP probable-space)
```

Bolt Beranek and Newman Inc.

Report No. 4681

APPENDIX II
THE NATURE-NURTURE DIALOGUE & A TRACE

In this appendix I present some of the pieces of conversation preceding and succeeding Excerpt 1, Chapter 1, and I present a trace of the process model simulating some sections of the discourse.

II.1 The Nature-Nurture Controversy

- M: 1. But, you see, the whole idea of the death penalty is so
2. completely illogical. Because, you kill somebody for killing
3. somebody, okay? The state does exactly what they're telling
4. the person not to do. And the state does it. That's what
5. happens, right? Why do they kill somebody? Because that
6. person murdered someone and then they murder him. But it's okay
7. if the state does it. it's not okay if the individual does it.
- R: 8. Yes, but, who's suppose to - You know that the woman that
9. Son-of-Sam killed, that his mother is paying tax - I'm sorry.
10. Son-of-Sam killed a woman, right?
- M: 11. Yeah.
- R: 12. A girl. By keeping him in jail, I know this is disgusting, but
13. still, by keeping him alive in jail, that woman whose daughter
14. was killed by this guy, she's paying her taxes to have this man
15. fed. Why should she?
- M: 16. Well, that doesn't impress me at all.
- R: 17. Why not?
- M: 18. Because, we're paying taxes
- R: 19. And, I'm paying taxes to have all these guys who won't allow
20. me to walk in the streets of N.Y. feeling comfortable.
- M: 21. But, listen, you're just paying taxes because this is a crazy

22. society that produces people who are as crazy as that, and we

R: 23. Oh, you don't believe there are some people who are
24. inherently evil?

M: 25. No, I don't.

D: 26. It's the same thing again with the danger of talking about
27. genetics to talk about inherent evil, you know. Okay, there

R: 28. But, some people are nicer than other people, right?

D: 29. No, there are some people who are naturally - Presumably,
30. there are some people who are naturally born with the uh
31. tendency to kill. But, that proportion is so small compared
32. to the number of people who kill that you'd be much safer
33. totally ignoring them and working on the people who are not
34. using that as their basis, who are not derived from genetic
35. reason if you know what I mean.

R: 36. Except, however, John and I just saw this two hour TV show

M: 37. Uh hum,

R: 38. where they showed - it was an excellent French TV
39. documentary - and they showed that, in fact, the
40. aggressive nature of the child is not really that
41. much influenced by his environment.

M: 42. How did they show that?

R: 43. They showed that by filming kids in kindergarten,

M: 44. Uh hum,

R: 45. showing his behavior among other children,

M: 46. And then?

R: 47. And showed him ten years later acting the same way,
48. towards, um,

D: 49. Well, of course, that's where he learns his behavior,
50. in kindergarten.

M: 51. Oh, sure.

R: 52. Now, another thing, it wasn't that he didn't have

J: 53. What? What's that? What'd you say?

R: 54. The aggressive child in kindergarten who acted the same
55. way later on.

J: 56. Yeah, he did.

R: 57. Oh, and it was twins. The important thing was that
58. there were two children from the same environment,
59. whereas only one of the brothers acted that way.
60. So, you couldn't blame it on the child's home.

D: 61. It has nothing to do with the child's home.
62. It has to do with the child's environment.

R: 63. Right, but, the two brothers have the same environment.

D: 64. They do not have the same environment.

R: 65. Why not?

D: 66. Because you and I are very close in this room right now
67. but we don't have the same environment.
68. Because I'm looking at you, I'm seeing that window
69. behind you. You're not seeing that window behind you.
70. You are not looking at you I am doing it.
71. Two people can't be in exactly the same place at the
72. same time, otherwise, they'd occupy the same space.
73. They do not have the same environment.
74. They do not have the same friends.

M: 75. And, I mean, they don't even - You know, to say that
76. two kids come from the same family is really meaningless,
77. because when you think of the difference in treatment
78. that two kids can get in exactly the same family, it's
79. incredible. You know, it's the difference between night
80. and day.

R: 81. All right, but, do you think these guys should work in prison
82. at least, I mean, or do you just think the people who are home
83. should be paying to have them fed for the next twenty years?

II.2 Tracing through portions of the dialogue

ENTERING: PRODUCE-NEXT-MOVE^{q4}

Choosing B: Discourse-Mode = "Discussion"
Go Developmental-Choice/Step 1

ENTERING: DEVELOPMENTAL-CHOICE/Step 1

CHOOSING A: go Start-Debate/Step 1

ENTERING: START-DEBATE/Step 1

Discourse-Mode <-- "Debate"
Future-Defender <- M
Side{1} <- (M)

CHOOSING 1: Push SHIFT-SPEAKERS

oldspeaker <-- M
CHOOSING SPEAKER <-- R
Participant-List <-- (J,D)
Participant-List <-- (M,J,D)

RETURNING TO: START-DEBATE/STEP 1

Side{2} <- (R)
Sides <-- ((M),(R))

ENTERING: CHALLENGE-CHOICE/STEP 2

C14.Comment = Nil
&
Expectation = Nil
&
C14.Goal = "Support"
THEREFORE
Expectation-List <-- ((Further-Challenge,R,C13))

^{q4}In the course of the trace, the reader will notice that at times I have simplified some of the speaker interchanges. In the main, however, I have not taken such liberties.

Expecation = Nil
 &
 C14.Goal = "Support"
 &
 C13.Anatagonists = Nil
 THEREFORE
 C13.Antagonists <- (R)

CHOOSING B: pushing to CHALLENGE-INDIRECTLY

STEP 1:

NOTE: Deciding whether to indirectly attack a previous claim
 or, if given, evidence of that claim.

C14.Goal = "Support"
 THEREFORE CHOOSING 4:
 space <- C14
 pushing to Close-Space

C14.State <- "Closed"
 All constituents get a "Zero" focus level assignment
 CCS <- C13
 State.C13 <- "Active"
 HEAD-CCS <- Nil

STEP 2:

Type-Further-Challenge = Nil Therefore

 R EXPRESS "Yes, but"

Choosing 3: No-op
 C13.Modality = "Evaluative"
 THEREFORE pushing NEW-CHALLENGE-EI

NOTE: Setting registers & constructing a new Evaluative-Issue context space.

rcontextual-function <- [
 co-relator <- C13]
 rgoal <- "Challenge"
 push CONSTRUCT-EICS
 ridentifier <- C15

SETSLOTS(C15)

RETURNING TO: NEW-CHALLENGE-EICS
returned register value: * = c15

nc <- C15
Go Update-Support-Analogy-Challenge

ENTERING: Update-Support-Analogy-Challenge

analogous-space = Nil
Re-Enter = Nil
HEAD-CCS = Nil
C13.State <- "Controlling"
HEAD-CCS <- C13
CCS <- C15
C15.State <- "Active"

RETURNING TO: CHALLENGE-INDIRECTLY/STEP 2

tempcontext = Nil
CHOOSING 2: Push Implicit-Mutually-Exclusive

ENTERING: IMPLICIT-MUTUALLY-EXCLUSIVE

STEP 1:

Note: The Implicit-Mutually-Exclusive claim, B, argued for by the antagonist, is that the state of affairs advocated by the protagonist has the same evaluative feature as does the state-of-affairs the protagonist is condemning.

INFERRING Evaluative-Claim, EC

where EC =
State-Of-Affairs = No death penalty
Evaluative-Predicate =
Dimension = Rationality
Polarity = Negative

NOTE: Add additional slot values to CCS

Setslots(C15)
Advocated-Inference <- "Don't do away with death penalty"
Claim <- EC
Mode <- "Implicit"
Contextual-Function <- [
Function <- "Mutually-Exclusive"]

Push Support-Choice/Step 2

Push Support-Of/Step 1

Step 1:

C15.Modality = "Evaluative" NE "Deontic"

Step 2:

Type-Further-Challenge = Nil

&

C15.SupportCS = Nil

Therefore Push Construct-Support-Space

```
ridentifier <- C16
Setslots(C16)
    Goal <- "Support"
    Contextual-Function <- [
        Co-Relator <- C15]
        Supporter <- R
```

RETURNING TO: Support-Of/Step 1
returned register value: * = c16

nc <- C16
Push Update-Support-Analogy-Challenge

```
analogous-space = Nil
Re-Enter = Nil
HEAD-CCS = C13 NE Nil
Therefore
space <- C13
Push Generating-Space
```

C13.State <- "Generating"
C13.Focus.High APPEND C13.Focus.Medium

```
C15.State <- "Controlling"
HEAD-CCS <- C15
CCS <- C16
CCS.State <- "Active"
```

RETURNING TO: Support-Of/Step 2

C16.Authority = Nil Therefore Choosing 3: No-Op

Choosing 3:

C16.Mode = "Implicit"

C15.Modality = "Evaluative"

Therefore Push Evaluative-Implication

NOTE: The speaker supports an evaluative claim by stating a state-of-affairs whose evaluative implication is the same as the claim being supported, and which follows from the state-of-affairs being evaluated in the first place.

R EXPRESS:

By keeping someone like Son-of-Sam in jail = "by" SA1
that woman whose daughter was killed by this guy,
she is paying her taxes to have this man fed. = SA2

because:

1. No death penalty

IMPLIES

Keeping someone like Son-of-Sam in jail

2. Possible Infer Evaluative-Principle, EP

where

EP =

State-of-Affairs = Victim paying for upkeep of victimizer

Evaluative-Predicate

Dimension = Rationality

Polarity = Negative

3. EP.Dimension = Rationality

= C15.Claim.Evaluative-Predicate.Dimension

4. EP.Polarity = Negative

= C15.Claim.Evaluative-Predicate.Polarity

5. No death penalty

Implies

Keeping victimizers in jail

Implies

victims paying for the upkeep of victimizers

6. Woman whose daughter was killed by Son-of-Sam

she is paying her taxes to have him fed

Instance

Victim pay for upkeep of victimizer

STEP 2:

NOTE: Fill in additional slots of CCS.

```
Setslots(C16)
Support-Fact      <-- SA2
Support-Principle <-- EP
Mappings    <-- ( (Woman whose daughter killed, Victim)
                  (Son-of-sam, Victimizer) )
Contextual-function <-- [
Function          <-- "Evaluative-Implication"]
```

RETURNING TO: Support-Of/Step 2

Step 3:

```
C15.SupportCS = Nil
Therefore C15.SupportCS <-- (C16)
```

RETURNING TO: Support-Choice/2

```
CHOOSING 1: C15.Mode = "Implicit"
& Type-Further-Challenge = Nil
Therefore (POP)
```

RETURNING TO: Challenge-Indirectly/Step 2

```
space <- C16
push Close-Space
```

```
C16.State<- "Closed"
C16.Focus.Zero <-
C16.Focus.High, C16.Focus.Medium, C16.Focus.Low
C16.Focus.High <- C16.Focus.Medium <- C16.Focus.Low <- Nil
```

RETURNING TO: Challenge-Indirectly/Step 2

```
CCS <- C15
C15.State <- "Active"
HEAD-CCS <- C13
C13.State <- "Controlling"
```

Step 3:

```
C13.Goal = "Challenge" NE "Support"
Therefore C13.CounterClaims <- C15
(POP)
```

RETURNING TO: CHALLENGE-CHOICE/Step 2

Step 3:

```
Expectation <-
Function   <- "Challenge-Choice"
Speaker    <- M
Context    <- C15
```

```
Expectation-List <-
((Challenge-Choice, M, C15), (Further-Challenge, R, C13))
```

```
Expectation <- Nil
Type-Further-Challenge <- Nil
```

ENTERING: PRODUCE-NEXT-MOVE

STEP 1:

```
CHOOSING A: Expectation-List NE Nil
Expectation <-> (Challenge-Choice, M, C15)
Go Challenge-Choice
```

ENTERING: CHALLENGE-CHOICE/Step 1

STEP 1:

```
Future-Defender <- R
```

CHOOSING A: Push Shift-Speaker-Expectation

```
M NE R THEREFORE Participant-List <-> (R,M,D,J)
Speaker <-> M
Participant-List <-> (R,D,J)
```

RETURNING TO: CHALLENGE-CHOICE/STEP 1

STEP 2:

```
C15.Comment = Nil
```

```
&
```

```
Expectation.Associated-Constraints = Nil
```

```
&
```

```
C15.Goal = "Challenge" NE "Analogy"/"Support"
```

```
THEREFORE Expectation-List
```

```
<-> ((Further-Challenge, M, C15), (Further-Challenge, R, C13))
```

AD-A103 566

BOLT BERANEK AND NEWMAN INC CAMBRIDGE MA

F/G 5/7

PLAIN SPEAKING: A THEORY AND GRAMMAR OF SPONTANEOUS DISCOURSE. (U)

N00014-77-C-0371

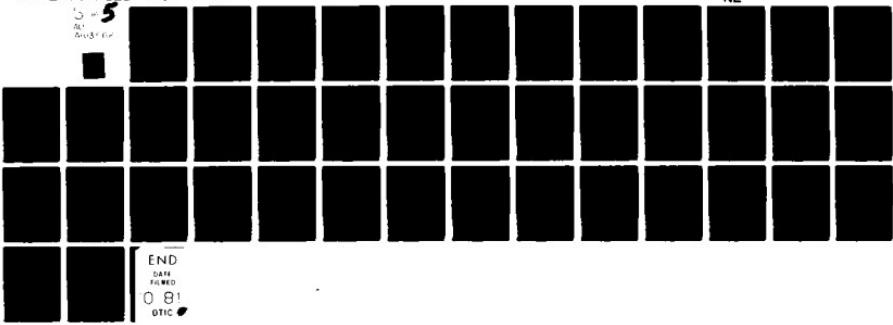
JUN 81 R REICHMAN

NL

UNCLASSIFIED

BBN=4681

5
M
Bolt Beranek



END
DATE
FILED
O 81
OTIC

Expectation.Associated-Constraints = Nil
&
C15.Goal = "Challenge" NE "Support"
&
C15.Antagonists = Nil
Therefore C15.Antagonists <- (M)

CHOOSING A: Push CHALLENGE-DIRECTLY

STEP 1:

Choosing A:
Expectation.Associated-Constraints = Nil
&
Not(For Some I,
 C15.Contextual-Function.Function =
 "Deny-Truth" OR "Apply-Expansion")
&
C15.Comment = Nil

Therefore Choosing 1: go emotive-flat-rejection

ENTERING: Emotive-Flat-Rejection

STEP 1:

NOTE: The new antagonist counters the previous arguer's statements
by dismissing the import of his/her argument.

NOTE: Setting registers & constructing a new comment context space.

rgoal <- "Challenge"
rcontextual-function <- [
 Function <- "Emotive-Flat-Rejection"
 Co-Relator <- C15]

pushing to CONSTRUCT-NEW-COMMENT

ridentifier <- C17
setslots(C17)

RETURNING TO: EMOTIVE-FLAT-REJECTION/STEP 1
Returned Register Value: * = C17

C15.Comment <- C17

Step 2:

M EXPRESS: "Well, that doesn't impress me at all"

NOTE: Add addtional slots to CCS.

Setslots(C17)
Claim <-- That doesn't impress me at all

RETURNING TO: CHALLENGE-CHOICE/STEP 2

STEP 3:

Expectation <-- [
Function <-- Challenge-Choice
Speaker <-- R
Context <-- C15]

Expectation-List <-- ((Challenge-Choice, R,C15),
(Further-Challenge,M,C15),
(Further-Challenge,R,C13))

Expectation <-- Nil

Type-Further-Challenge <- Nil
Go Produce-Next-Move

ENTERING: PRODUCE-NEXT-MOVE

CHOOSING A: Expectation-List NE Nil
Choosing Expectation <- (Challenge-Choice, R, C15)
go challenge-choice

ENTERING: Challenge-Choice/Step 1

Future-Defender <- M

Choosing A: push Shift-Speaker-Expectation

R NE M
Therefore Participant-List <- (M,R,D,J)
Speaker <- R
Participant-List <- (M,D,J)

RETURNING TO: Challenge-Choice/Step 1

Step 2:

C15.Comment = "Emotive-Flat-Rejection"

Expectation.Associated-Constraints = Nil
 & C15.Comment.Goal = "Challenge"

Choosing A: Push Challenge-Directly/Step 1

Choosing B: Expectation.Associated-Constraints = Nil
 &
 C15.Comment.Contextual-Function.Function
 = "Emotive-Flat-Rejection"
 Therefore go Demand-Support-Rejection

ENTERING: Demand-Support-Rejection

Note: Add challenge comment onto Oldcomments slot and destroying link to a separate comment space.

C15.Oldcomments <- ((That doesn't impress me))

C15.Comments <- Nil

 R EXPRESS: "Why?"

STEP 2:

NOTE: Note that on the next turn the previous speaker is expected to supply cause for his/her flat rejection.

Expectation.Associated-Constraints
 <-- "Supply-Support-Rejection"

RETURNING TO: CHALLENGE-CHOICE/STEP 3

Expectation <-- [
 Function <-- Challenge-Choice
 Speaker <-- M
 Context <-- C15]

Expectation-List
 <-- ((Challenge-Choice,M,C15,"Supply-Support-Rejection"),
 (Further-Challenge,M,C15),
 (Further-Challenge,R,C13))

Expectation <- Nil
 Type-Further-Challenge <- Nil
 go produce-next-move

ENTERING: PRODUCE-NEXT-MOVE

Choosing A: Expectation-List NE Nil
Expectation <- (Further-Challenge, R, C13)
go further-challenge

ENTERING: FURTHER-CHALLENGE

Step 1:

Choosing A: Push Shift-Speaker-Expectation

R EQ R Therefore (POP)

RETURNING TO: FURTHER-CHALLENGE/Step 1

Step 2:

R EXPRESS: "And"

Step 3:

irrelevant-context <- C15
push Find&DeleteExpectations-Irrelevant-Contexts

Step 1:

Expectations-To-Be-Deleted <-
((Challenge-Choice, M, C15, "Supply-Support-Rejection"),
(Further-Challenge, M, C15))
Expectation-List = Nil

Intervening-Subarguments <- C15
irrelevant-contexts-list <- (C13)

Step 2:

irrelevant-context <- C13
irrelevant-contexts-list <- Nil
irrelevant-context = C13 NE Nil
irrelevant-context = C13 EQ Expectation.Context Therefore go step 2

Step 2:

irrelevant-context <- Nil
irrelevant-context = Nil Therefore (POP)

RETURNING TO: FURTHER-CHALLENGE/Step 3

Step 4:

Future-Defender <- Oneof(C13.protagonists) <- M

Choosing A:

C13.Counterclaims = C15

&

C15 Member Intervening-Subarguments

&

C15.SupportCS = C16 NE Nil

Therefore

HEAD-CCS <- C15

C15.State <- "Controlling"

CCS <- C16

Type-Further-Challenge <- "Support"

Intervening-Subarguments <- Nil

Expectation-List

<-- ((Challenge-Choice,M,C15,"Supply-Support-Rejection"))

(Further-Challenge,M,C15),

(Further-Challenge,R,C13))

Step 5:

space = Nil

Update-Constraints = Nil

Expectations-To-Be-Deleted <- Nil

Intervening-Subarguments <- Nil

go further-challenge-support/step 3

ENTERING: FURTHER-CHALLENGE-SUPPORT/STEP 3

Type-Further-Challenge = "Support"

Therefore

NOTE: Deciding whether to use same reasoning and/or the same authority as used in a prior support space for this claim.

Choosing A: Same-Principle <- True

C16.State = "Closed"

CCS <- C15

go support-choice/step 2

ENTERING: SUPPORT-CHOICE/STEP 2

Push Support-Of

ENTERING: SUPPORT-OF

Step 1:

C15.Modality = "Evaluative" NE "Deontic"

Step 2:

Type-Further-Challenge = "Support"
Therefore Push Construct-Support-Space

```
ridentifier <-- C18
Setslots(C18)
Goal <-- "Support"
Contextual-Function <-- [
  Co-Relator <-- C15]
  Supporter <-- R
```

RETURNING TO: Support-Of/Step 1
returned register value: * = c18

nc <- C18
Push Update-Support-Analogy-Challenge

```
analogous-space = Nil
Re-Enter = Nil
HEAD-CCS = Nil
C15.State <- "Controlling"
HEAD-CCS <- C15
CCS <- C18
CCS.State <- "Active"
```

RETURNING TO: Support-Of/Step 2

C18.Authority = Nil
Therefore Choosing 3: No-Op

Choosing 3:
C15.Mode = "Implicit"
& C15.Modality = "Evaluative"
Therefore Push Evaluative-Implication

STEP 1:

NOTE: The speaker supports an evaluative claim by stating a state-of-affairs whose evaluative implication is the same as the claim being supported, and which follows from the state-of-affairs being evaluated in the first place.

R EXPRESS: I'm paying taxes to have fed all these guys who won't allow me to walk in the streets of N.Y.
feeling comfortable. = SA1

because:

1. No death penalty
IMPLIES

R, a citizen, paying taxes to keep criminals, harrassers, fed in jail.

2. Same-Principle NE Nil

Then EP <- C16.Support-Principle

where

EP =

State-of-Affairs = Victim paying for upkeep
of victimizer

Evaluative-Predicate

Dimension = Rationality

Polarity = Negative

Same-Principle <- Nil

3. EP.Dimension = Rationality

= C15.Claim.Evaluative-Predicate.Dimension

4. EP.Polarity = Negative

= C15.Claim.Evaluative-Predicate.Polarity

5. No death penalty

Implies

Keeping victimizers in jail

Implies

victims paying for the upkeep of victimizers

6. R paying taxes to have her harrassers fed in jail

Instance

Victim pay for upkeep of victimizer

STEP 2:

NOTE: Fill in additional slots of CCS.

Setslots(C18)

Support-Fact <- SA2

Support-Principle <- EP

```
Mappings    <--  ( (R , Victim)
                  (men who won't let R walk streets,
                   Victimizer) )
Contextual-function <-- [
Function          <--  "Evaluative-Implication"]
```

RETURNING TO: Support-Of/Step 2

Step 3:

```
C15.SupportCS = (C16)
Therefore C15.SupportCS <-- (C18, C16)
```

RETURNING TO: Support-Choice/2

Step 3:

```
C15.Mode = "Implicit"
& Type-Further-Challenge NE Nil
Therefore
Type-Further-Challenge <-- nil
go produce-next-move
```

ENTERING: PRODUCE-NEXT-MOVE

```
Choosing A: Expectation-List NE Nil
choosing Expectation
      <- (Challenge-Choice, M, C15, "Supply-Support-Rejection")
go challenge-choice
```

ENTERING: CHALLENGE-CHOICE

STEP 1:

Future-Defender <- R

CHOOSING A: push SHIFT-SPEAKER-EXPECTATION

```
M NE R THEREFORE Participant-List <-- (R,M,D,J)
Speaker <-- M
Participant-List <-- (R,D,J)
```

RETURNING TO: CHALLENGE-CHOICE/STEP 1

Step 2:

```
Expectation.Associated-Constraints = "Supply-Support-Rejection"
& C18.Goal = "Support" & M Member C15.Antagonists
```

CHOOSING A: Push CHALLENGE-DIRECTLY

STEP 1:

Choosing E:

C17.Goal = "Support" Therefore Choosing 3: No-Op

Type-Further-Challenge = Nil
 & Expectation.Associated-Constraints = "Supply-Support-Rejection"
 Therefore

 M EXPRESS: "Because"⁹⁵

Expectation.Associated-Constraints <- Nil
 Choosing 3: No-Op
 Choosing A: C17.Goal = "Support"
 & C17.Method = "Evaluative-Implication"
 NE "Analogy"
 Therefore Push New-Challenge-EPI

STEP 1:

NOTE: Setting registers & constructing a new epistemic issue context space.

rgoal <-- "challenge"
 rcontextual-fucntion <-- [
 co-relator <-- c17]
 rmode <-- "explicit"

push CONSTRUCT-EPICS

ridentifier <-- c19
 setslots(c19)

RETURNING TO: NEW-CHALLENGE-EPICS/STEP 1
 returned register value: * = c19

⁹⁵I have not modelled R's interruption of M's initial go at this substantive demanded challenge. Therefore, here, the "Because" stems from M's initial response which was interrupted and re-stated with a "But listen" on M's following turn; the "But listen" being related to R's going on without listening to M's proposed alternative side of the issue.

```
HEAD-CCS NE nil THEREFORE state(c15) <-- "generating"  
state(c17) <-- "controlling"  
HEAD-CCS <-- c17  
CCS <-- c19  
state(c19) <-- "active"
```

RETURNING TO: CHALLENGE-DIRECTLY/STEP 1

Push Challenge-Support-Specifics

ENTERING: Challenge-Support-Specifics

Choosing A: go challenge-basis-support

ENTERING: CHALLENGE-BASIS-SUPPORT

STEP 1:

CHOOSING A: go challenge-mappings

STEP 1:

Note: Challenge based on rejecting applicability of principle to case at hand due to a lack of presupposition mappings.

M EXPRESS: R is paying taxes because this is a crazy society which produces people who are as crazy as that. = P

because:

1. Possible Infer Implication(P) = SA2
where SA2 =

R, as a member of society, is responsible for the criminal behavior of people like those who won't let her walk the streets in comfort.

S.T.

1. For I = 1
2. C17.Mappings.Y{1} = R
3. C17.Mappings.X{1} = Victim
4. PR = Not Responsible
5. SA2 Denies that R is not responsible for being victimized
6. Victim is not responsible is a presupposition of the generic principle:
(victim paying for upkeep of victimizer rationality, negative)

STEP 2:

NOTE: Add additional slots to CCS.

```
Setslots(C19)
  Contextual-Function <-- [
    Function           <-- "Challenge-Mappings"]
    Claim
    State-of-affairs   <-- R is paying taxes because this is a crazy
                          society which produces victimizers.
    Epistemic-Predicate <-- True
```

RETURNING TO: Challenge-Directly/Step 1

Step 2:

```
C17.Goal = "Support" & C17.Method NE "Analogy"
Therefore C15.Countersupports <- (C19)
```

RETURNING TO: CHALLENGE-CHOICE/STEP 2

STEP 3:

```
Expectation <-- [
  Function     <-- Challenge-Choice
  Speaker      <-- R
  Context      <-- C19]
```

```
Expectation-List <-- ((Challenge-Choice, R,C19),
                      (Further-Challenge,M,C15),
                      (Further-Challenge,R,C13))
```

```
Expectation <- Nil
Type-Further-Challenge <- Nil
go produce-next-move
```

ENTERING: PRODUCE-NEXT-MOVE

```
Choosing A: Expectation-List NE Nil
choosing Expectation <-- (Challenge-Choice,R,C19)
go challenge-choice
```

ENTERING: CHALLENGE-CHOICE

STEP 1:

Future-Defender <- M

CHOOSING A: Push SHIFT-SPEAKER-EXPECTATION

```
R NE M THEREFORE Participant-List <-- (M,R,D,J)
Speaker <-- R
Participant-List <-- (M,D,J)
```

RETURNING TO: CHALLENGE-CHOICE/STEP 1
C17.Comment = Nil
& Expectation.Associated-Constraints = Nil

NE "Supply-Support-Claim"
Or
"Supply-Support-Rejection"
& C17.Goal = "Challenge" NE "Support"
THEREFORE Expectation-List <-- ((Further-Challenge,R,C19),
(Further-Challenge,M,C15),
(Further-Challenge,R,C13))

Expectation.Associated-Constraints = Nil
& C19.Comment = Nil
& C19.Goal = "Challenge" NE "Support"
& C19.Antagonists = Nil
Therefore C19.Antagonists <- (R)

CHOOSING B: Push CHALLENGE-INDIRECTLY

STEP 1:

NOTE: Deciding whether to indirectly attack a previous claim or,
if given, evidence of that claim.

C19.SupportCS = Nil & CCS.Goal NE "Support"

Type-Further-Challenge = Nil
Therefore

R EXPRESS: "But"

Choosing 3: No-Op
C19.Modality = "Epistemic"
THEREFORE Push NEW-CHALLENGE-EPICS

Note: Setting registers & constructing new epistemic
issue context space.

```
rcontextual-function <-- [
co-relator <-- C19]
rgoal <-- "Challenge"
rmode <-- "Explicit"
```

pushing to CONSTRUCT-EPICS

```
ridentifier <-- C20
setslots(C20)
```

RETURNING TO: NEW-CHALLENGE-EPICS/STEP 1
returned register value: * = c20

```
HEAD-CCS = C17 NE Nil THEREFORE C17.State <-- "Generating"
C19.State <-- "Controlling"
HEAD-CCS <-- C19
CCS <-- C20
C20.State <-- "Active"
```

RETURNING TO: CHALLENGE-INDIRECTLY/STEP 2

Choosing 1: C19.Claim.Epistemic.Predicate = "True"
THEREFORE Push EXCLUSIVE-OR-MTP

STEP 1:

NOTE: Protagonist: "A is true"
Antagonist: "B is true"
A EXCLUSIVE-OR B So A can't be true.

```
#####
R EXPRESS: There are some people who are inherently evil. = P
#####
```

because:

1. Epistemic-Claim(P) =
State-of-Affairs = some (many) people are inherently evil
Epistemic-Predicate = true
2. R is paying taxes because this is a crazy society which
which produces people who are as crazy as victimizers
(i.e., Society produces criminals)
EXCLUSIVE-OR
People are inherently evil
(i.e., Genetics produces criminals)

STEP 2:

NOTE: Add additional slot values to ccs.

```
Contextual-Function <-- [
  Function      <-- "EXCLUSIVE-OR-MTP"]
  Claim        <-- P
```

RETURNING TO: CHALLENGE-INDIRECTLY/STEP 2

Step 3:

C19.Goal = "Challenge" NE "Support"
Therefore C19.Counterclaims <- (C20)

RETURNING TO: CHALLENGE-CHOICE/STEP 2

STEP 3:

Expectation <- [
Function <- Challenge-Choice
Speaker <- M
Context <- C20]

Expectation-List <- ((Challenge-Choice, M,C20),
(Further-Challenge,R,C19)
(Further-Challenge,M,C15),
(Further-Challenge,R,C13))

Expectaion <- nil

Type-Further-Challenge <- Nil
go produce-next-move

ENTERING: PRODUCE-NEXT-MOVE

Choosing A: Expectaion-List NE nil
choosing Expectation <- (Challenge-Choice,M,C20)

ENTERING: CHALLENGE-CHOICE

STEP 1:

Future-Defender <- R
Chooding B: knownside <- M
Push SHIFT-SPEAKER-SAMESIDE

STEP 1:

current-side <- Side{1} = (M)
current-side = (M) = knownside

STEP 2:

oldsides <- ((M),(R))
CHOOSING Speaker <- D; Participant-List <- (M,J)

```

side{1} <- (D,M)
Participant-List <- (R,M,J)
D not on any previous side

```

RETURNING TO: CHALLENGE-CHOICE/STEP 1

STEP 2:

```

C20.Comment = Nil
& Expectation.Associated-Constraints = Nil
& C20.Goal = "Challenge" NE "Support"
Therefore Expectation-List <- ((Further-Challenge,D,C20),
                               (Further-Challenge,R,C19),
                               (Further-Challenge,M,C17),
                               (Further-Challenge,R,C13))
Expectation.Associated-Constraints = Nil NE "Supply-Support-Claim"
& C20.Comment = Nil
& C20.Goal = "Challenge"
& C20.Antagonists = Nil
Therefore C20.Antagonists <- (D)

```

CHOOSING A: Push CHALLENGE-DIRECTLY

STEP 1:

Choosing E:

NOTE: Actual engagement by antagonist into validity of the protagonist's previous statements.

NOTE: Deciding whether to attack a previous claim or, if given, evidence of that claim.

C20.SupportCS = Nil & C20.Goal = "Challenge" NE "Support"

Type-Further-Challenge = Nil &
Expectation.Associated-Constraints = Nil

```

*****  

D EXPRESS "No"  

*****

```

Choosing C: Push NEW-CHALLENGE-EPI

STEP 1:

NOTE: Setting registers & constructing new epistemic issue context space.

rcontextual-function <- [

```
co-relator      <-- c20]
rgoal          <-- "Challenge"
rmode          <-- "Explicit"
```

pushing to CONSTRUCT-EPICS

```
ridentifier <-- c21
setslots(c21)
```

RETURNING TO: NEW-CHALLENGE-EPICS
returned register value: * = c21

```
HEAD-CCS = c19 NE nil THEREFORE state(c19) <-- "Generating"
C20.State <-- "Controlling"
HEAD-CCS <-- C20
CCS       <-- C21
C21.State <-- "Active"
```

RETURNING TO: CHALLENGE-DIRECTLY/STEP 1

Push RANGE-APPLICATION

STEP 1:

NOTE: Epsilon protagonist's claim.

```
*****  
D EXPRESS: Presumably there are some people who are naturally
born with the tendency to kill
= SA1
= SA3
but that proportion is so small compared to the number
of people who kill
= SA2
that you'd be much safer totally ignoring them
*****
```

because:

1. Presumably there are some people who are naturally born with
the tendency to kill =
= For some X True Subsummation of
People are inherently evil
2. That proportion is so small compared to the number of people
who kill
= In general not true Subsummation of
People are inherently evil.

STEP 2:

NOTE: Add additional slot values to ccs.

```

Setslots(C21)
  Contextual-Function <-- [
    Function           "Range-Application"
    Claim              <-- [
      State-of-Affairs <-- Most people who kill are naturally born
                           tendency to do so
      Epistemic-Predicate <-- Not True]
  ]

```

RETURNING TO: CHALLENGE-DIRECTLY/Step 1

```

C20.Goal = "Challenge" NE "Support"
Therefore C20.Counterclaims <- (C21)

```

RETURNING TO: CHALLENGE-CHOICE/step 2

STEP 3:

```

Expectation <-- [
  Function     <-- Challenge-Choice
  Speaker      <-- R
  Context      <-- c21]
Expectation-List <-- ((Challenge-Choice, R,C21),
                      (Further-Challenge,D,C20),
                      (Further-Challenge,R,C19),
                      (Further-Challenge,M,C15),
                      (Further-Challenge,R,C13))

```

```

Expectation <- nil
Type-Further-Challenge <- Nil
go produce-next-move

```

ENTERING: PRODUCE-NEXT-MOVE

```

CHOOSING A: Expectation-List NE Nil
            choosing Expectation <-- (Challenge-Choice, R, C21)

```

ENTERING: CHALLENGE-CHOICE/Step 1

```

Future-defender <- D

```

CHOOSING A: pushing to SHIFT-SPEAKER-EXPECTATION

```

R NE D THEREFORE Participant-List <-- (D,R,M,J)
SPEAKER <-- R
Participant-List <-- (D,M,J)

```

RETURNING TO: CHALLENGE-CHOICE/STEP 1

STEP 2:

C21. Comment = Nil
&

Expectation.Associated-Constraints = Nil

C21.Goal = "Challenge" NE "Support"

8

C21. Antagonists = Nil

SUGGING: REACHING TO CHALLENGE INDIRECTLY

SEER-1

NOTE: Deciding whether to indirectly attack a previous claim or, if given evidence of that claim,

C21 Goal NF "Support" & C21 SupportCS = Nil

STEP 2:

NOTE: Generating appropriate clue words for an indirect challenge.

Type-Further-Challenge = Nil
& Expectation.Associated-Constraints = Nil
Therefore

R EXPRESS "Except, however"

NOTE: Creating new challenge issue context space.

C21.Modality = "Epistemic"
THEREFORE Push NEW-CHALLENGE-EPI

STEP 1:

NOTE: Setting registers & constructing new epistemic issue context space.

```
rcontextual-function <- [  
    co-relator      <- C21]  
rgoal            <- "Challenge"  
rmode            <- "Explicit"  
  
Push CONSTRUCT-EPI  
  
ridentifier <- C22  
setslots(C22)  
  
RETURNING TO: NEW-CHALLENGE-EPI  
returned register value: * = C22  
  
nc <- C22  
go update-support-analogy-challenge  
  
ENTERING: UPDATE-SUPPORT-ANALOGY-CHALLENGE  
  
Analogous-Space = Nil  
Re-Enter = Nil  
HEAD-CCS = C20 NE Nil  
Therefore space <- C20; Push Generating-Space  
  
C20.State <- "Generating"  
C20.Focus.Medium <- (C20.Focus.Medium, C20.Focus.High)  
C20.Focus.High <- Nil  
  
RETURNING: Update-Support-Analogy-Challenge  
  
C21.State <- "Controlling"  
HEAD-CCS <- C21  
CCS <- C22  
C22.State <- "Active"  
  
RETURNING TO: CHALLENGE-INDIRECTLY/STEP 2  
  
NOTE: Choosing whether to preface claim with an authority for  
the claim.  
  
CHOOSING: 2: Push Cite-Authority  
  
STEP 1:  
  
NOTE: Citing source of claim and possible access to this source.  
  
C22.Goal = "Challenge" NE "Support"  
Therefore Push Construct-Support-Space
```

```
ridentifier <- C23
setslots(C23)
Contextual-Function <- [
    Co-Relator      <- C22]
    Supporter       <- R
    Goal            <- "Support"

(POP C23)
```

RETURNING TO: CITE-AUTHORITY/STEP 1
returned register value: * = C23

R EXPRESS: "JOHN & I just saw this two hour tv show,"

```
Setslots(c23)
Source          <- TV show
Access          <- R & J watched on TV
```

STEP 2:

NOTE: Choosing whether to give credentials of source.

CHOOSING 2:

R EXPRESS: "It was an excellent French TV documentary."

because: Lends credibility(it was an excellent French TV
documentary, tv show)

```
Setslots(C23)
Authority.Credentials <- Excellent French documentary
```

RETURNING TO: CHALLENGE-INDIRECTLY/STEP 2
returned register value: * = C23

C22.SupportCS <- C23

R EXPRESS: They showed that

Where: "They" = C23.Authority.Source = People who performed study

Note: Choosing an appropriate form of indirect challenge.

Choosing 4: C21.Modality = "Epistemic"
 & C21.Epistemic-Predicate = "Not-True"
 THEREFORE Push MODUS-TOLLENDO-PONENS⁹⁶

STEP 1:

NOTE: Protagonist: "A is not true"
 Antagonist: "B is not true"
 A EXCLUSIVE-OR B SO A must be true.

R EXPRESS: "In fact, the aggressive nature of the child
 is not really that much influenced by his
 environment." = P

because:

1. P.Epistemic-Predicate = "Not True"
2. General(A child's aggressive nature is
 influenced by his environment)
 = People's aggressive nature is caused by their environment
3. General(Most people who kill are genetically
 determined to do so)
 = People's aggressive nature is caused by genetics
4. Possible(Believe(2 Exclusive-OR 3))

Step 2:

Note: Add additional slot values to CCS.

Setslots(C22)

Claim	<-- [
State-Of-Affairs	<-- The aggressive nature of the child is mainly influenced by his environment
Epistemic-Predicate	<-- Not True]
Contextual-Function	<-- [
Function	<-- "Modus-Tollendo-Ponens"]

RETURNING TO: CHALLENGE-INDIRECTLY/STEP 2

Step 3:

Note: Append challenge onto Countersupports/CounterClaims slot

⁹⁶See footnote accompanying this move in the grammar description.

of issue space just challenged.

C21.Goal = "Challenge" NE "Support"
Therefore C21.Counterclaims <-- (C22)

RETURNING TO: CHALLENGE-CHOICE/STEP 2

STEP 3:

```
Expectation <-- [  
  Function <-- Challenge-Choice  
  Speaker <-- D  
  Context <-- C22]  
Expectation-List<-- ((Challenge-Choice, D,C22),  
                      (Further-Challenge,R,C21),  
                      (Further-Challenge,D,C20),  
                      (Further-Challenge,R,C19),  
                      (Further-Challenge,M,C15),  
                      (Further-Challenge,R,C13))  
Expectation <-- Nil  
Type-Further-Challenge <- Nil  
go produce-next-move
```

ENTERING: PRODUCE-NEXT-MOVE

STEP 1:

Choosing A: Expectation-List NE Nil
Choosing: Expectaion <-- (Challenge-Choice,D,C22)

ENTERING: CHALLENGE-CHOICE

STEP 1:

Future-defender <- R

Choosing B: knownside <- D
Push SHIFT-SPEAKER-SAMESIDE

STEP 1:

```
current-side <-- (M,D)  
current-side NE (D)  
THEREFORE CHOOSING B:  
  Speaker <- M  
  Participant-List <-- (D,J)  
  Participant-List <-- (R,D,J)
```

RETURNING TO: CHALLENGE-CHOICE/STEP 1

STEP 2:

C22.Comment = Nil
& Expectation.Associated-Constraints = Nil
& C22.Goal = "Challenge" NE "Support"
THEREFORE Expectation-List <- ((Further-Challenge,M,C22),
(Further-Challenge,R,C21),
(Further-Challenge,D,C20),
(Further-Challenge,R,C19),
(Further-Challenge,M,C15),
(Further-Challenge,R,C13))

STEP 2:

Expectation.Associated-Constraints = Nil
& C22.Comment = Nil

& C22.Antagonists = NIL

Therefore C22.Antagonists <- (M)

CHOOSING A: push CHALLENGE-DIRECTLY

STEP 1:

Choosing C: Expectation.Associated-Constraints = Nil
& C22.Comment = Nil
& C23.Support-fact = Nil
Therefore Replace (Further-Challenge, M, C22)
on Expectation-List with
(Challenge-Choice, M, C22)
go demand-support-claim

ENTERING: DEMAND-SUPPORT-CLAIM

STEP 1:

NOTE: Antagonist expresses a "how" or "why" question that demands
that the previous speaker give supportive evidence of
her/his previously made claim.

M EXPRESS: "How did they show that?"

where "they" = C23.Authority.Source = People who did the study

STEP 2:

NOTE: Noting that on the next turn, the challenged conversant is
expected to supply supportive evidence of her/his previously
made claim.

Expectation.Associated-Constraints <- "Supply-Support-Claim"

RETURNING TO: CHALLENGE-CHOICE/STEP 2

STEP 3:

Expectation <-- [
Function <-- Challenge-Choice
Speaker <-- R
Context <-- C22]

Expectation-List

<-- ((Challenge-Choice,R,C22,"Supply-Support-Claim"),
(Further-challenge,M,C22),
(Further-challenge,R,C21),
(Further-Challenge,D,C20),
(Further-Challenge,R,C19),
(Further-Challenge,M,C15),
(Further-Challenge,R,C13))

Expectation <-- nil

Type-Further-Challenge <- Nil
go produce-next-move

ENTERING: PRODUCE-NEXT-MOVE

STEP 1:

Choosing A: Expectation-List NE Nil
choosing Expectation
<-- (Challenge-Choice,R,C22,"Supply-Support-Claim")

ENTERING: CHALLENGE-CHOICE

STEP 1:

Future-Defender <- M

CHOOSING A: Push SHIFT-SPEAKER-EXPECTATION

STEP 1:

R NE M THEREFORE Participant-List <-- (M,R,D,J)
SPEAKER <-- R
Participant-List <-- (M,D,J)

RETURNING TO: CHALLENGE-CHOICE/STEP 1

STEP 2:

Expectation.Associated-Constraints = "Supply-Support-Claim"

THEREFORE Expectation.Associated-Constraints <-- Nil
go Support-Choice/Step 2

ENTERING: SUPPORT-CHOICE/Step 2

Push Support-Of

STEP 1:

C22.Modality = "Epistemic" NE "Deontic"

STEP 2:

Type-Further-Challenge = Nil
& C22.SupportCS = C23 NE Nil

Therefore nc <- C23

Push Update-Support-Analogy-Challenge

Analogous-space = Nil
Re-Enter = Nil
HEAD-CCS = C21 NE Nil
THEREFORE space <- C21
Push Generating-Space

C21.State <- "Generating"
C21.Focus.Medium <- (C21.Focus.Medium, C21.Focus.High)
C21.Focus.High <- Nil
C22.State <- "Controlling"
HEAD-CCS <- C22
CCS <- C23
C23.State <- "Active"

(POP)

RETURNING TO: Support-of/Step 2

C23.Authority NE Nil

Note: Choosing Support mode & clue words appropriate for that mode.

Choosing 3: C23.Authority NE Nil Therefore

```
*****  
R EXPRESS: "They showed that by filming kids"  
*****  
Setslots(C23)  
Authority.Method <- Filming kids  
  
C22.Modality = "Epistemic"
```

& C22.Claim.Epistemic-Predicate = "Not True"
THEREFORE Push MODUS-TOLLENS

STEP 1:

NOTE: The rule of logic used here is:

Given: A IMPLIES B
Showing: Not B
Results: Not A

R EXPRESS: A child's social interactive behavior ten years
years after kindergarten was identical to his
social interactive behavior in kindergarten. = F

because:

1. Same-Principle = Nil

2. Possible Infer If-Then-Principle
where

ITP =

Ifpart: One's social interactive behavior is
influenced/determined by one's environment
Thenpart: Over time one's social interactive behavior
changes

3. A child's social interactive behavior ten years after
kindergarten was identical to his social interactive
behavior in kindergarten

INSTANCE

Not(Over time one's social interactive behavior changes)

4. The aggressive nature of the child is mainly influenced
by his environment

INSTANCE

One's social interactive behavior is influenced/determined
by one's environment

STEP 2:

NOTE: Add additional slot values to CCS.

Setslots(C23)
Mappings <-- [
ThenMappings <-- (child,one) (ten years duration from
kindergarten,over time)

```
If Mappings    <-- (child,one) (aggressive nature,
                           social interactive
                           behavior)]
Support-Principle <-- ITP
Contextual-Function <-- [
  Function        <-- "Modus-Tollens"]
Support-Fact      <-- F
```

RETURNING TO: SUPPORT-OF/STEP 2

STEP 3:

C22.SupportCS = C23

RETURNING TO: SUPPORT-CHOICE/STEP 2

Step 3:

```
Choosing 1: C22.Mode = "Explicit" NE "Implicit"
Therefore Type-Further-Challenge <- Nil
go produce-next-move
```

ENTERING: PRODUCE-NEXT-MOVE

```
Choosing A: Expectation-List NE Nil
Choosing: Expectation <- (Challenge-Choice, M, C22)
go challenge-choice
```

ENTERING: Challenge-Choice

STEP 1:

Future-Defender <- R

```
Choosing B: knownside <- M
Push Shift-Speaker-Sameside/Step 1
```

```
current-side <-- (M,D)
current-side NE (M)
THEREFORE CHOOSING 2: SPEAKER <-- D
Participant-List <-- (M,J)
Participant-List <-- (R,M,J)
```

RETURNING TO: CHALLENGE-CHOICE/STEP 1

```
Expectation.Associated-Constraints = Nil
& C22.Comment = Nil
& C23.Goal = "Support"
```

THEREFORE Expectation-List <- ((Further-Challenge,D,C22),
(Further-Challenge,R,C21),
(Further-Challenge,D,C20),
(Further-Challenge,R,C19),
(Further-Challenge,M,C17),
(Further-Challenge,R,C13))

Expectation.Associated-Constraints = Nil
& C23.Comment = Nil
& C23.Goal = "Support" NE "Challenge"
& C22.Antagonists = (M)
Therefore C22.Antagonists <- (D,M)
CHOOSING B: Push CHALLENGE-DIRECTLY

STEP 1:

Choosing E:

NOTE: Choosing whether to attack claim or support, if appropriate.

C23.Goal = "Support" CHOOSING 3: No-Op

Note: Generating appropriate clue words for direct substantive challenge.

Type-further-Challenge = Nil
& Expectation.Associated-Constraints = Nil
& C23.Method = "Modus-Tolliens"
THEREFORE NOTE: "Unexpected" event was not unexpected.

D EXPRESS: "Well, of course"

C22.Modality = "Epistemic"
Therefore Push NEW-CHALLENGE-EPI

STEP 1:

NOTE: Setting registers & constructing a new epistemic issue context space.

rcontextual-function <-[
co-relator <- C23]
rgoal <- "Challenge"
rmode <- "Explicit"

Push Construct-EPI

ridentifier <- C24
setsslots(C24)

RETURNING TO: Construct-New-Challenge-EPI
returned register value: * = c24

go Update-Support-Analogy-Challenge

Re-Enter = Nil & HEAD-CCS = C22 NE Nil
Therefore space <- C22
push Generating-Space

C22.State <- "Generating"

RETURNING TO: Update-Support-Analogy-Challenge

C23.State <- "Controlling"
HEAD-CCS <- C23
CCS <- C24
C24.State <- "Active"

RETURNING TO: CHALLENGE-DIRECTLY/STEP 1

Note: Optional citation of authority for claim to be given.

Choosing 3: No-Op

Note: Choosing one of many forms of direct challenges.

Choosing A: C23.Goal = "Support" & C23.Method NE "Analogy"
Therefore Push Challenge-Support-Specifics

STEP 1:

CHOOSING A: go challenge-basis-support

ENTERING: CHALLENGE-BASIS-SUPPORT

NOTE: Antagonist invalidates protagonist's supporting evidence
by attacking its reliance on an inapplicable or falacious
support-principle.

CHOOSING B: go challenge-scope

ENTERING: CHALLENGE-SCOPE

STEP 1:

NOTE: Principle used was overgeneralized to cover class of objects under which it does not hold.

D EXPRESS: "That's where he learns his behavior,
in kindergarten." = F

because:

1. A child learns his behavior in kindergarten
IMPLIES
After kindergarten a child's behavior is learnt and fixed
2. A child's behavior is fixed after kindergarten
IMPLIES
Change limited to before kindergarten
Therefore
"Over Time in a environment" of the generic principle:
If A person's behavior is environmentally influenced
Then Over time in an environment
a person's behavior will change
Must be "Over Time in an environment" Before Kindergarten
3. The "Over Time" used by the protagonist
= "Ten years After kindergarten"

STEP 2:

NOTE: Add additonal slot values to ccs.

```
Setslots(C24)
Contextual-funciton <-- [
  Function          <-- "Limit-Scope"]
  Claim            <- [
    State-Of-aAffairs <-- A child learns his behavior
                        in kindergarten
                        Implies
                        Before kindergaten
                        (over time in an environment)
    Epistemic-Predicate <-- True]
```

RETURNING TO: Challenge-Directly/Step 1

C23.Goal = "Support"
Therefore C22.CounterSupports <-- (C24)

RETURNING TO: CHALLENGE-CHOICE/STEP 2

```
Expectation <-- [
  Function <-- "Challenge-Choice"
  Speaker <-- R
  context <-- C24]
Expectation-List <-- ((Challenge-Choice,R,C24), (F-C,D,C23)
  (F-C,M,C22), (F-C, R, C21), (F-C,D,C20)
  (F-C,R,C19), (F-C, M, C15),(F-C,R,C13))
```

```
Expectation <-- Nil
Type-Further-Challenge <- Nil
go produce-next-move
```

ENTERING: PRODUCE-NEXT-MOVE

```
Choosing A: Expectation-List NE Nil
Choosing: Expectation <- (Challenge-Choice, R, C24)
go Challenge-Choice
```

ENTERING: CHALLENGE-CHOICE

STEP 1:

Future-Defender <- D

CHOOSING A: Push SHIFT-SPEAKER-EXPECTATION

STEP 1:

```
R NE D THEREFORE Participant-List <-- (D,M,R,J)
SPEAKER <-- R
Participant-List <-- (D,M,J)
```

RETURNING TO: CHALLENGE-CHOICE/STEP 1

```
C24.Comment = Nil
& Expectation.Associated-Constraints = Nil
```

```
Expectation-List <-- ((Further-Challenge,R,C24), (F-C,D,C23)
  (F-C,M,C22), (F-C, R, C21), (F-C,D,C20)
  (F-C,R,C19), (F-C, M, C15),(F-C,R,C13))
```

```
C24.Comment= Nil
& Expectation.Associated-Constraints = Nil
& C24.Goal = "Challenge" NE "Support"
& C24.Antagonists = Nil
```

Therefore C24.Antagonists <- R
CHOOSING A: Push CHALLENGE-DIRECTLY

STEP 1:

Choosing D: Type-Further-Challenge = Nil
& C24.Goal = "Challenge"
go concede-subargument

ENTERING: Concede-Subargument

Step 1:

Choosing 2:

R EXPRESS "Now, another thing"

Step 2:

Choosing 3:

Step 3:

Note: A challenger's counter claim and evidence, if any, are accepted. Put these contexts in "closed" state to reflect that no further argumentation of these spaces is expected.

C24.Goal = "Challenge" NE "Support"
Therefore space <- C24; Push Close-Space

C24.State <- Closed
All focus assignments go to zero.

Intervening-Subarguments <- C24
rejected-space <- C23

STEP 4:

NOTE: If what was rejected (& accepted as invalid or irrelevant) was a support of a claim, then the speaker may still salvage this claim by giving an alternative support of it, i.e., one not open to previous criticisms.

C23.Goal = "Support"
Therefore push Implicit-Concession

.

REFERENCES

1. Adams M. Failures to comprehend and levels of processing in reading. In Theoretical Issues in Reading Comprehension, Spiro R. Bruce B. Brewer W., (Ed.), 1980, 11-32.
2. Allen J. A plan-based approach to speech act recognition. Ph.D. Th., University of Toronto, 1979.
3. Anderson R.C. Pichert J.W. Recall of previously unrecallable information following a shift in perspective. Journal of Verbal Learning and Verbal Behavior 17, 1978, 1-12.
4. Anderson R. Picher J. Shirey L. Effects of the reader's schema at different points in time. 119, Bolt, Beranek & Newman, Inc., 1979.
5. Attneave F. Multistability in perception. In Image, Object, and Illusion, Held R., (Ed.), 1974, 91-99.
6. Austin J.L. How To Do Things With Words. Oxford University Press, 1962.
7. Bartlett F.C. Remembering. Cambridge University Press, 1932.
8. Bates M. The theory and practice of augmented transition network grammars. In Natural Language Communication with Computers, Bolc L., (Ed.), 1980.
9. Bennett J. Linguistic Behavior. Cambridge University Press, 1976.
10. Black M. Metaphor revisited. In Metaphor and Thought, 1979.
11. Bobrow R. Webber B. PSI-KLONE - Parsing and semantic interpretation in the BBN natural language understanding system. CSCSI/CSEIQ Annual Conference, 1980.
12. Bobrow R. Webber B. Knowledge Representation for syntactic/semantic processing. Proceedings of the First Annual National Conference on Artificial Intelligence, 1980.
13. Bransford J.D. Johnson M.K. Contextual prerequisites for understanding: Some investigations of comprehension and recall. Journal of Verbal Learning and Verbal Behavior 11, 1972, 717-726.
14. Brewer W. Literary theory, rhetoric, and stylistics: Implications for psychology. In Theoretical Issues in Reading Comprehension, Spiro R. Bruce B. Brewer W., (Ed.), 1980, 221-237.

15. Bruce B. Discourse Models and Language Comprehension. American Journal of Computational Linguistics, 1975, 19-35.
16. Bruce B. Analysis of interacting plans as a guide to the understanding of story structure. Poetics 9, 1980, 295-311.
17. Carbonell J. Metaphor - A key to extensible semantic analysis. Proceedings of the 18th Annual Meeting of the ACL, 1980, 17-21.
18. Chafe W. Structures and human knowledge. In Language Comprehension and the Acquisition of Knowledge, Carroll J.B. Freedle R.O., (Ed.), 1975.
19. Chafe W. Givenness, contrastiveness, definiteness, subjects, and topics. In Subject and Topic, Li C., (Ed.), 1976.
20. Chafe W. The development of consciousness in the production of narrative. In The Pear Stories: Cognitive and Linguistic Aspects of Narrative Production, Chafe W., (Ed.), 1979.
21. Chafe W. Language and memory. Language 49, 2, 1973, 261-281.
22. Chomsky N. Aspects of a Theory of Syntax. M.I.T. Press, 1965.
23. Chomsky N. Rules and representations. The Behavioral and Brain Sciences 3, 1, 1980, 1-61.
24. Cohen P. On knowing what to say: Planning speech acts. Ph.D. Th., University of Toronto, 1978.
25. Cohen P. Perrault R. Elements of a plan-based theory of speech acts. Cognitive Science 3, 1979, 177-212.
26. Cohen R. Understanding arguments. Proceedings of the CSCSI, Canadian Society for Computational Studies of Intelligence, 1980.
27. Cohen P. Perrault A. Allen J. Beyond question-answering. In Strategies for Natural Language Processing, Lehnert W. Ringle M., (Ed.), 1981.
28. Collins A. Quillian M. Retrieval time from semantic memory. Journal of Verbal Learning and Verbal Behavior 8, 1969, 240-247.
29. Collins A. Loftus E.F. A spreading-activation theory of semantic processing. Psychological Review 82, 6, 1975, 407-428.
30. Collins A. Warnock E. Aiello N. Miller M. Reasoning from incomplete knowledge. In Representation and Understanding, Bobrow D. G. Collins A., (Ed.), 1975, 383-415.

31. Collins A. Gentner D. A framework for a cognitive theory of writing. In Cognitive Processes in Writing: An Interdisciplinary Approach, Gregg L.W. Steinberg E., (Ed.), 1980.
32. Comrie B. Aspect. Cambridge University Press, 1976.
33. Danes F. Papers on Functional Sentence perspective. Publishing House of the Czech Academy of Sciences, 1974.
34. Dore J. Children's illocutionary acts. In Discourse Production and Comprehension, Freedle R., (Ed.), 1977, 227-244.
35. Fillmore C.J. The case for case. In Universals in Linguistic Theory, Bach E. Harms R.T., (Ed.), 1968.
36. Fillmore C.J. Discourse Deixis. In The Santa Cruz Lectures on Deixis, 1975.
37. Firbas J. On the concept of communicative dynamism in the theory of functional sentence perspective. SPFFBU 19, 1971, 135-144.
38. Gentner D. The structure of analogical models in science. 4451, Bolt Beranek and Newman Inc., 1980.
39. Gentner D. Metaphor as structure - Preserving mapping. Proceedings American Psychological Association, 1980.
40. Gentner D. Are scientific analogies metaphors? In Problems and Perspectives, Miall D., (Ed.), 1981.
41. Gibson E.J., Gibson J.J., Pick A.D., & Osser H. A developmental study of the discrimination of letter-like forms. J. Comp. Physiol. Psychology 55, 1962, 897-906.
42. Goetz E. Armbruster B. Psychological correlates of text structure. In Theoretical Issues in Reading Comprehension, Spiro R. Bruce B. Brewer W., (Ed.), 1980, 201-221.
43. Goffman E. Frame Analysis. Harper & Row, 1974.
44. Goodman B. A model for a natural language data base system. R-798, University of Illinois, 1977.
45. Grice H.P. Utterer's meaning, sentence-meaning, and word-meaning. In Oxford Readings in Philosophy, Searle J.R., (Ed.), 1971, 54-70.
46. Grice, H. P. Logic and conversation. In Syntax and Semantics, Cole P. and Morgan J., (Eds.), 1975, 41-58.

47. Grimes J. Topic levels. Theoretical Issues in Natural Language Processing-2, Association for Computational Linguistics, 1978.
48. Grimes J.E. Context structure patterns. Proceedings of Nobel Symposium on Text Processing, Nobel Symposium on Text Processing, 1980.
49. Grosz B. The representation and use of focus in dialogue understanding. Ph.D. Th., University of California at Berkeley, 1977.
50. Halliday M.A.K. Some aspects of the thematic organization of the English clause. RM-5224-PR, The Rand Corporation, 1967.
51. Halliday M. A. K. Functional diversity in language as seen from a consideration of modality and mood in english. Foundations of Language 6, 1970, 322-361.
52. Halliday M.A.K. Language and Social Man. Longman Group Ltd., 1975.
53. Halliday M.A.K. Text as a semantic choice in social contexts. In Grammars and Descriptions, van Dijk T.A. Petofi J.S., (Ed.), 1976.
54. Halliday M.A.K. Hasan R. Cohesion in English. Longman Group Ltd., 1976.
55. Hankamer J. Sag I. Deep and surface anaphora. Linguistic Inquiry 7, 3, 1976, 391-426.
56. Harris Z. Methods in Structural Linguistics. The University of Chicago Press, 1951.
57. Harweg R. Substitutional text linguistics. In Current Trends in Textlinguistics, Petofi J., (Ed.), 1977.
58. Hasan R. Code, register and social dialect. In Class, Codes and Control, II, Bernstein B., (Ed.), 1973, 253-292.
59. Hasan R. The place of stylistics in the study of verbal art. In Style and Text, Ringbom H., (Ed.), 1975, 49-63.
60. Hasan R. Text in the systemic-functional model. In Current Trends in Textlinguistics, Petofi J., (Ed.), 1977.
61. Hein U. Interruptions in dialogue. In Dialogmuster und Dialogprozesse, Metzing D., (Ed.), 1980.
62. Hobbs J. A Computational Approach to Discourse Analysis. City University of New York, 1976.

63. Hobbs J. Metaphor schemata, and selective inferencing. Stanford Research Institute, 1979.
64. Hobbs J. Evans D. Conversation as planned behavior. Cognitive Science 4, 1980, 317-345.
65. Hymes D. The ethnography of speaking. In Anthropology and Human Behavior, Gladwin T. Sturtevant W.C., (Ed.), 1962, 13-53.
66. Hymes D. Language in culture and society. Harper & Row, 1964.
67. James W. The Principles of Psychology. New York: Holt, 1890.
68. Jefferson G. Sequential aspects of storytelling in conversation. In Studies in the Organization of Conversational Interaction, Schenkein J., (Ed.), 1979.
69. Jefferson G. Schenkein J. Some sequential negotiations in conversation. In Studies in the Organization of Conversational Interaction, Schenkein J., (Ed.), 1979, 134-155.
70. Johnson-Laird P.N. Mental models in cognitive science. Cognitive Science 4, 1980, 71-115.
71. Katz J. Fodor J. The structure of a semantic theory. Language 39, 1963, 170-210.
72. Kinstch W. van Dijk T.A. Comment on se rappelle et on resumes des histoires. Langages 40, 1975, 98-116.
73. Karmiloff-Smith A. Language as a formal problem-space for children. MPG-NIAS Child Language Conference: Beyond Description in Child Language, 1979.
74. Kuno S. Empathy and syntax. In Harvard Studies in Syntax and Semantics, Kuno S., (Ed.), 1975, 1-73.
75. Kuno S. Gapping: A functional analysis. Linguistic Inquiry 7, 2, 1976, 300-318.
76. Kuno S. Generative Discourse Analysis in America. In Current Trends in Textlinguistics, Petofi J., (Ed.), 1977.
77. Labov W. Language in the Inner City. University of Pennsylvania Press, 1972.
78. Labov W. Fanshel D. Therapeutic Discourse. Academic Press, Inc., 1977.

79. Lakoff R. Remarks on this and that. Proceedings of the Tenth Regional Meeting of the Chicago Linguistic Society, 1974.
80. Lange B. Making sense with schemata. Journal of Reading 24, 5, 1981, 442-445.
81. Lachman R. Dooling D.J. Connected discourse and random strings: Effects of number of inputs on recognition and recall. Journal of Experimental Psychology 17, 1968, 517-522.
82. Levinsohn S.H. Progression and Digression in Inga (Quechuan) Discourse. Forum Linguisticum 1, 1976, 122-147.
83. Lewis D.K. Convention. Cambridge University Press, 1969.
84. Linde C. Information structures in discourse. Ph.D. Th., Columbia University, 1974.
85. Linde C. The organization of discourse. In The English Language in Its Social and Historical Context, Shope T. Zwicky A. Griffen P., (Ed.), forthcoming.
86. Linde C. Gougen J. Structure of planning discourse. J. Social Biol. Struct. I, 1978, 219-251.
87. Longrace R.E. Hierarchy and Universality of Discourse Constituents in New Guinea Languages: Discussion. Georgetown University Press, 1972.
88. Longrace R. Levinsohn S. Field analysis of discourse. In Current Trends in Textlinguistics, Petofi J., (Ed.), 1977.
89. Mandler J.M. Johnson N.S. Remeberance of things parsed: story structure and recall. Cognitive Psychology 9, 1977, 111-151.
90. Meyer B.J.F. Following the author's top-level structure. In Understanding Reader's Understanding, Tierney R. Mitchell J. Anders P., (Ed.), 1977.
91. Meyer B.J.F. A selected review and discussion of basic research on prose comprehension. Arizona State University, 1979.
92. Miller G.A. Images and models: Similes and metaphors. In Metaphor and Thought, Ortony A., (Ed.), 1979, 202-250.
93. Minsky M. A framework for representing knowledge. In The Psychology of Computer Vision, Winston P., (Ed.), 1975.

94. Montague R. Formal Philosophy: Selected Papers of Richard Montague. Yale University Press, 1974.
95. Morgan J. Sellner M. Discourse and linguistic theory. In Theoretical Issues in Reading Comprehension, Spiro R. Bruce B. Brewer W., (Ed.), 1980, 165-201.
96. Morgan J. Green G. Pragmatics and reading comprehension. In Theoretical Issues in Reading Comprehension, Spiro R. Bruce B. Brewer W., (Ed.), 1980, 113-141.
97. Mosenthal P. Three types of schemata in children's recall of cohesive and noncohesive text. Proceedings of the AERA, 1978.
98. Neisser U. Cognitive Psychology. Meredith Publishing Company, 1967.
99. Newman D. Children's understanding of strategic interaction. Ph.D. Th., City University of N.Y., 1980.
100. Lindsay P. Norman D. Human Information Processing. Academic Press, 1972.
101. Olson D. Language and thought: Aspects of a cognitive theory of semantics. Psychological Review 77, 4, 1970, 257-273.
102. Ortony A. Beyond literal similarity. Psychological Review 86, 1979, 161-180.
103. Palková Z. Palek B. Functional sentence perspective and textlinguistics. In Current Trends in Textlinguistics, Petofi J., (Ed.), 1977.
104. Pike K. Language in Relation to a Unified Theory of the Structure of Human Behavior. Mouton, 1967.
105. Polanyi L. The American story: Cultural constraints on the meaning and structure of stories in conversation. Ph.D. Th., University of Michigan, 1978.
106. Polanyi L. False starts can be true. Proceedings BLS, Berkeley Linguistic Society, 1978.
107. Power R. The organization of purposeful dialogues. Linguistics 17, 1979, 107-152.
108. Pratt M. L. Towards a Speech Act Theory of Literary Discourse. Indiana University Press, 1977.
109. Prince G. A Grammar of Stories. The Hague: Mouton, 1973.

110. Propp V. Morphology of the Folktale. Austin: University of Texas Press, 1968.
111. Reichenbach H. Elements of Symbolic Logic. Macmillan Company, 1947.
112. Reichman, R. Conversational coherency. Cognitive Science 3, 1978, 283-327.
113. Reichman R. Conversational coherency in technical conversations. Institut Pour Les Etudes Semantiques et Cognitives, 1979.
114. Rumelhart D. Notes on a schema for stories. In Language, Thought, and Culture, Bobrow D. Collins A., (Ed.), 1975.
115. Rumelhart D.E. Schemata: The building blocks of cognition. In Theoretical Issues in Reading Comprehension, Spiro R. Bruce B. Brewer W., (Ed.), 1980.
116. Sacks H. Schegloff E. Jefferson G. A Simplest Systematics for the Organization of Turn-Taking for Conversation. Language 50, 4, 1974, 696-735.
117. Sadock J. Modus brevis: The truncated argument. Papers from the 13th Regional Meeting of the Chicago Linguistic Society, Chicago Linguistic Society, 1977.
118. Schank R. Abelson R.P. Scripts, Plans, Goals, and Understanding. Lawrence Erlbaum Association, 1977.
119. Schiffрин D. Meta-talk: Organizational and evaluative brackets in discourse. In Studies in Language and Social Interaction, Zimmerman D. West C., (Ed.), 1980.
120. Schmidt C.F. Understanding human action: Recognizing the plans and motives of other persons. In Cognition and Social Behavior, Carroll J. Payne J., (Ed.), 1976.
121. Schmidt S. Some problems of communicative text theories. In Current Trends in Textlinguistics, Petofi J., (Ed.), 1977.
122. Schutz A. Reflections on the Problem of Relevance. Yale University Press, 1970.
123. Scribner S. Modes of thinking and ways of speaking: Culture and logic reconsidered. In Thinking: Readings in Cognitive Science, Johnson-Laird P.N. Wason P.C., (Ed.), 1977, 483-500.
124. Searle J.R. Speech Acts. Cambridge University Press, 1969.

125. Searle J.R. What is a speech act? In Oxford Readings in Philosophy, Searle J.R., (Ed.), 1971, 39-53.
126. Sheridan M.E. A review of research on schema theory and its implication for reading instruction in secondary reading. Indiana University at South Bend, 1978.
127. Sidner C. Towards a computational theory of definite anaphora comprehension in English discourse. Ph.D. Th., Massachusetts Institute of Technology, 1979.
128. Sinclair J. Mch. Coulthard R.M. Towards an Analysis of Discourse - The English used by teachers and pupils. Oxford University Press, 1975.
129. Spiro R. Constructive processes in prose comprehension and recall. In Theoretical Issues in Reading Comprehension, Spiro R. Bruce B. Brewer W., (Ed.), 1980, 245-278.
130. Schegloff E. Sacks H. Opening up closings. Semiotica 8, 1973, 289-327.
131. Sternberg R.J. Component processes in analogical reasoning. Psychological Review 84, 1977, 353-378.
132. Tennant H. Evaluation of natural language processors. Ph.D. Th., University of Illinois, 1980.
133. Thorndyke P.W. Cognitive structures in comprehension and memory of narrative discourse. Cognitive Psychology 9, 1977, 77-110.
134. Toulmin S. The Uses of Argument. Cambridge University Press, 1958.
135. van Dijk T. Macrostructures: An Interdisciplinary Study of Global Structures in Discourse, Interaction and Cognition. Erlbaum Associates, 1980.
136. Vendler Z. Singular terms. In Semantics, Steinberg D. Jakobovits L., (Ed.), 1971.
137. Webber B. A formal approach to discourse anaphora. Ph.D. Th., Harvard University, 1978.
138. Weiner J. The structure of natural explanation: Theory and application. System Development Corporation, 1979.
139. Wilensky R. Understanding goal-based stories. Ph.D. Th., Yale University, 1978.
140. Winston P.H. Learning and reasoning by analogy. Communications of the ACM 23, 12, 1980, 689-702.

141. Wittgenstein L. Philosophical Investigations. Oxford: Blackwell, 1953.
142. Woods W. A. Transition network grammars for natural language analysis. Comm. ACM 13, 1970, 591-606.
143. Woods W. What's in a link? In Representation and Understanding, Bobrow D. Collins A., (Ed.), 1975, 35-82.
144. Woods W. Cascaded ATN grammars. American Journal of Computational Linguistics 6, 1, 1980, 1-12.
145. Wootton A. Dilemmas of Discourse. Allen G. Unwin Ltd., 1975.